DRAFT

ENVIRONMENTAL IMPACT STATEMENT: RIVER ISLANDS AT LATHROP, PHASE 2B

VOLUME 2

October 2014

Appendix A – EIS Distribution, Noticing, and Scoping

Appendix A-1

EIS Distribution and Noticing

Name	Title	Organization	Address	PO Box	City, Zip Code	Phone	E-mail
	Community Development Agency	Alameda County	399 Elmhurst Street, Room 136		Hayward, CA 94544		
	Planning Department	Amador County	500 Argonaut Lane		Jackson, CA 95642		
		AT&T	44 West Yokuts		Stockton, CA 95205		
Bill Draa	Superintendent	Banta Elementary School District	22375 El Rancho Rd		Tracy, CA 95304	209-835-0843	
		Baykeeper, Deltakeeper Chapter	785 Market Street, Suite 850		San Francisco, CA 94103		
Alicia Guerra		Briscoe Ivester & Bazel	155 Sansome St, 7th Floor		San Francisco, CA 94104	415-402-270	aguerra@briscoelaw.net
		Building Association of the Delta	509 Weber #410		Stockton, CA 95203		
	Mid California Office	Bureau of Reclamation	7794 Folsom Dam Road		Folsom, CA 95630		
	Planning Department	Calaveras County	891 Mountain Ranch Road		San Andreas, CA 95249		
Ramon Batista		Califia LLC (dba River Islands at Lathrop)	73 W. Stewart Road		Lathrop, CA 95330	209-879-790	RBatista@cambaygroup.com
Susan Dell'Osso	Project Director	Califia LLC (dba River Islands at Lathrop)	73 W. Stewart Road		Lathrop, CA 95330	209-879-790	SDellosso@cambaygroup.com
		California Air Resources Board		PO Box 2815	Sacramento, CA 95812		
	School Facility Planning	California Department of Education	1430 N Street		Sacramento, CA 95814		
		California Department of Fish and Game	1416 9th Street		Sacramento, CA 95814		
		California Department of Toxic Substances Control		PO Box 806	Sacramento, CA 95812		
Tom Dumas	Chief	California Department of Transportation	1976 East Charter Way	PO Box 2048	Stockton, CA 95201	209-941-1921	
		California Department of Water Resources		PO Box 942836	Sacramento, CA 94236		
Bill Jennings	Executive Director	California Sportfishing Protection Alliance	3536 Rainier Avenue		Stockton, CA 95204		
Bill Martin		Central Valley Farm Trust	8788 Elk Grove Blvd, Building 1, Suite 1		Elk Grove, CA 95624		
Jay Punia	General Manager	Central Valley Flood Protection Board	3310 El Camino Avenue, Room 151		Sacramento, CA 95821	916-574-068	jpunia@water.ca.gov
Patricia Leary		Central Valley Regional Water Quality Control Board	3443 Routier Road, Suite A		Sacramento, CA 95827-3003	916-255-3000	
Timothy R. O'Brien		Central Valley Regional Water Quality Control Board	3443 Routier Road, Suite A		Sacramento, CA 95827-3003	916-255-3000	
Cary Keaton	City Manager	City of Lathrop	390 Towne Centre Dr		Lathrop, CA 95330	209-941-722	cmanager@ci.lathrop.ca.us
Charlie Mullen	Principal Planner	City of Lathrop	390 Towne Centre Dr		Lathrop, CA 95330	209-941-729	cmullen@ci.lathrop.ca.us
Steve Salvatore	Community Development Director	City of Lathrop	390 Towne Centre Dr		Lathrop, CA 95330	209-941-729	communitydevelopment@ci.lathrop.ca.us
Tom Ruark	City Engineer	City of Lathrop	390 Towne Centre Dr		Lathrop, CA 95330		tom@ruarkeng.com
	Planning Department	City of Ripon	259 North Wilma Avenue		Ripon, CA 95366		
	Community Development Department	City of Tracy	520 Tracy Boulevard		Tracy, CA 95376		
	Community Development Department	Contra Costa County	651 Pine Street, 4th Floor, North Wing		Martinez, CA 94533		
Linda Fiack	Executive Director	Delta Protection Commission	14215 River Road	PO Box 530	Walnut Grove, CA 95690	916-776-229	dpc@citlink.net
Dennis J. O'Bryant	Acting Assistant Director	Department of Conservation, Division of Land Resource Protection	801 K Street, MS-1801		Sacramento, CA 95814	916-324-0850	
Dr. Tom Williams	Managing Director	Dubai Isles Development	700A Howe Street		San Mateo, CA 94401	650-558-959	ctwilliams@yahoo.com
		FEMA Region IX	1111 Broadway, Suite 1200		Oakland, CA 94602		
Steve Herum		Herum Crabtree Brown	2291 West March Lane, Suite B100		Stockton, CA 95207		
Susan Dell'Osso	President	Island Reclamation District No. 2062	16976 S. Harlan Road		Lathrop, CA 95330	209-858-2040	
		Lathrop Chamber of Commerce	16976 S. Harlan Road		Lathrop, CA 95330		
Fred Manding	Fire Marshal	Lathrop-Manteca Fire District	800 J Street		Lathrop, CA 95330	209-858-2331	
Dennis L. Hay		Law Offices of Mehlhaff & Hay	23950 South Chrisman Road, Suite A	PO Box 1129	Tracy, CA 95378-1129		
Benjamin J. Cantu	Advanced Planning Manager	Manteca Community Development Department	1001 West Center Street		Manteca, CA 95337		
Ric Reinhardt	Principal	MBK	1771 Tribute Way		Sacramento, CA 95815	916-456-440	reinhardt@mbkengineers.com
Thomas J. Rosten	District Engineer	Mossdale Reclamation District No. 2107	227 Alvarado Way		Tracy, CA 95376	209-836-0829	
		National Marine Fisheries Service	501 Ocean Blvd		Long Beach, CA 90802		
		National Oceanic and Atmospheric Administration	1401 Constitution Ave, Room 5128		Washington, DC 20230		
Richard Roos-Collins	Senior Attorney	Natural Heritage Institute	100 Pine Street, Suite 1550		San Francisco, CA 94111		
Monte Schmidt	San Joaquin River Project Manager	Natural Resources Defense Council	111 Sutter Street, 20th Floor		San Francisco, CA 94104		
		Northern California Water Agencies	455 Capitol Mall #335		Sacramento, CA 95814		
		Pacific Gas and Electric Company	2730 Gateway Oaks Dr, Suite 220		Sacramento, CA 95833		
Henry Long	President	Reclamation District No. 17	1812 Burnside Way		Stockton, CA 95207	209-478-1696	
	Community Development Department	Sacramento County	827 7th Street, Room 230		Sacramento, CA 95814		
		San Joaquin Audubon Society		PO Box 7755	Stockton ,CA 95217		
	Planning Division	San Joaquin County Council of Governments	222 East Weber Avenue		Stockton, CA 95202	209-235-0600	
		San Joaquin County Environmental Health Department	304 Weber Avenue, Third Floor		Stockton, CA 95202		
		San Joaquin County LAFCO	1860 East Hazelton Ave		Stockton, CA 95205		
Wendy Johnson	Environmental Coordinator	San Joaquin County Public Works	1810 East Hazelton Avenue		Stockton, CA 95205	209-468-3085	
		San Joaquin Partnership	2800 W. March Lane #470		Stockton, CA 95219		
Stacey Mortensen		San Joaquin Regional Rail Commission	949 East Channel Street		Stockton, CA 95202		
John Cadrett	Air Quality Planner, Northern Region	San Joaquin Valley Air Pollution Control District	4230 Kiernan Avenue, Suite 130		Modesto, CA 95356	209-557-6400	
	Planning and Development Department	Santa Clara County	70 West Hedding, 7th Floor, East Wing		San Jose, CA 95110		
Eric Parfrey	Chair	Sierra Club, Mother Lode Chapter	1421 W. Willow Street		Stockton, CA 95203	209-462-707	Eric@baseline-env.com
	Resource Management Department	Solano County	675 Texas Street #550		Fairfield, CA 94533		
John Herrick		South Delta Water Agency	4255 Pacific Avenue, Suite 2		Stockton, CA 95207	209-956-015	Jherrlaw@aol.com
		South San Joaquin Irrigation District		PO Box 747	Ripon, CA 95366		
	Planning and Community Development Department	Stanislaus County	1010 Tenth Street, Suite 3400		Modesto, CA 95350		
		State Department of Conservation	801 K Street, 24th Floor		Sacramento, CA 95814		
		State of California Office of Planning and Research State Clearinghouse	1400 Tenth Street		Sacramento, CA 95814	916-445-0613	

Name	Title	Organization	Address	PO Box	City, Zip Code	Phone	E-mail
		Stockton East Water District	6767 E. Main Street		Stockton, CA 95215		
		Stockton Planning Department	345 N. El Dorado Street		Stockton, CA 95202		
F. Allan Chapman		The Cambay Group Inc.	2990 Oak Road, Suite 400		Walnut Creek, CA 94597		
Jim Franco	Superintendent	Tracy Unified School District	1875 W. Lowell Avenue		Tracy, CA 95376	209-830-3245	
	Public Works Department	Tuoloumne County, A.N. Francisco Building	48 W. Yaney Ave, 3rd Floor		Sonora, CA 95370		
Bill Guthrie	Project Manager	U.S. Army Corps of Engineers, Sacramento District	1325 J Street, Regulatory Division		Sacramento, CA 95814-2922	916-557-526	William.H.Guthrie@usace.army.mil
Claire Marie Turner	Section 408 Project Manager	U.S. Army Corps of Engineers, Sacramento District	1325 J Street		Sacramento, CA 95814-2922	916-557-672	Claire.Marie.Turner@usace.army.mil
Lisa Clay	Legal Counsel	U.S. Army Corps of Engineers, Sacramento District	1325 J Street		Sacramento, CA 95814-2922	916-557-529	Lisa.H.Clay@usace.army.mil
Mark Finan		U.S. Army Corps of Engineers, Sacramento District	1325 J Street, Room 1480		Sacramento, CA 95814-2922		
Patti Johnson	Project Manager	U.S. Army Corps of Engineers, Sacramento District	1325 J Street, Regulatory Division		Sacramento, CA 95814-2922		Patti.P.Johnson@usace.army.mil
	Regulatory Branch	U.S. Army Corps of Engineers, San Francisco District	211 Main Street		San Francisco, CA 94105-1905		
David H. Solouff	Chief, Bridge Section	U.S. Coast Guard, District Eleven	U.S. Coast Guard Island Building 50-3		Alameda, CA 94501-5100	510-437-3514	
Nova Blazej	Acting Manager	U.S. Environmental Protection Agency	75 Hawthorne Street		San Francisco, CA 94105-3901	415-972-3847	
David L. Harlow	Acting Field Supervisor	U.S. Fish and Wildlife Service	2800 Cottage Way, Room W-2605		Sacramento, CA 95825-1846	916-414-6520	
	State Supervisor	U.S. Fish and Wildlife Service	2800 Cottage Way, Room E-1823		Sacramento, CA 95825-1846		
Patrick Kerr	Manager of Industry and Public Projects	Union Pacific Railroad	10031 Foothills Blvd		Roseville, CA 95747		
Fleener Richards			701 Bobcat Ln		Manteca, CA 95336		
Robert C. & Eileen R. Young			2107 Terraza Place		Fullerton, CA 92835		

Appendix A-2

Notice of Intent

prepare a Draft Second Supplemental Environmental Impact Statement (DSEIS) for the Tamiami Trail feature of the Modified Water Deliveries to Everglades National Park (MWD) project in Miami-Dade County. The study is a cooperative effort between the U.S. Army Corps of Engineers, Everglades National Park (ENP), the Florida Department of Transportation, and the South Florida Water Management District.

FOR FURTHER INFORMATION CONTACT: Jon Moulding, U.S. Army Corps of Engineers, Planning Division, Environmental Branch, P.O. Box 4970, Jacksonville, FL 32232–0019, by e-mail, *jon.moulding@usace.army.mil*, or by telephone at 904–232–2286.

SUPPLEMENTARY INFORMATION:

a. Authorization: The MWD project in South Florida was authorized by the Everglades National Park Protection and Expansion Act of 1989. Prior to the current study, a Final GRR/SEIS on the project was coordinated with the public in December 2003. The document was withdrawn without a Record of Decision because additional information on costs and benefits required a revision of plan formulation and evaluation.

b. Project Scope: The primary goal of the MWD project is to improve water deliveries to ENP from the Central and Southern Florida project. The Tamiami Trail feature involves means to convey water south under Tamiami Trail, U.S. Highway 41, into Northeast Shark River Slough of ENP. Specific Objectives include passing peak MWD flows under the highway in as natural a way as practicable without adversely affecting the roadbed and public safety.

c. Preliminary Alternatives: The previously examined alternatives will be reevaluated in light of new hydrologic modeling that indicates the need for a higher design water elevation, greater construction costs resulting from increases in market costs of material, concerns for public safety, and the need to raise the profile of any portion of the road that would not be bridged.

d. Issues: The RGRR/SEIS will consider impacts on health and safety, aesthetics and recreation, cultural resources, socio-economic resources, hydrology, water quality, ecosystem habitat, fish and wildlife resources, threatened and endangered species, and construction costs.

e. Scoping: As the nature of the issues have not changed since the previous document was issued, no additional scoping is planned.

f. Public Involvement: Public workshops may be held over the course of the study; the exact location, dates, and times will be announced in public notices and local newspapers. A Public meeting will be held after release of the Draft RGRR/SEIS; the exact location, date, and times will be announced in a public notice and local newspapers.

g. Coordination: The proposed action is in accordance with the Fish and Wildlife Coordination Act (FWCA) of 1958 and the Endangered Species Act (ESA) of 1973. The coordinating agencies include the U.S. Fish and Wildlife Service, Everglades National Park, the Florida Fish and Wildlife Conservation Commission, the Florida Department of Transportation, and the South Florida Water Management District.

h. Other Environmental Review and Consultation: The proposed action would involve evaluation for compliance with guidelines pursuant to Section 404(b) of the Clean Water Act and the National Historic Preservation Act.

i. Agency Role: As cooperating agency, Everglades National Park will provide extensive information and assistance on the resources to be impacted and alternatives.

j. DSEIS Preparation: The integrated draft RGRR, including a DSEIS, is currently estimated for publication in August 2005.

Dated: June 3, 2005.

Stuart J. Appelbaum,

Chief, Planning Division.

[FR Doc. 05–11498 Filed 6–9–05; 8:45 am]

BILLING CODE 3710–AJ–M

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare a Draft Environmental Impact Statement for the Proposed River Islands Project, in San Joaquin County, CA

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The U.S. Army Corps of Engineers, Sacramento District (Corps), will prepare a Draft Environmental Impact Statement (DEIS) for Corps authorization actions for the proposed River Islands project. The overall project purpose is to construct a large-scale, mixed-use project consisting of residential development, a commercial complex, and which may include open space and recreational amenities, located in San Joaquin County or the south delta area. The DEIS will address impacts such as major changes in the operation and maintenance of a Federal flood control project, navigation, hydrology, water quality, wetlands, endangered species, agricultural resources, transportation, cultural resources, and air quality.

DATES: The projected date for public release of the DEIS is November, 2006. Two public scoping meetings will be held on June 29, 2005, to receive comments on the proposed contents of the DEIS. One meeting will be held during business hours at 1:30 p.m. and the second will be held in the evening at 7 p.m. to accommodate the schedules of participants.

ADDRESSES: The scoping meetings will be held at the Lathrop Community Room, 15453 7th Street, Lathrop, CA 95330. Written comments may be mailed to Ms. Patti Johnson at, 1325 J Street, Room 1480, Sacramento, CA 95814–2922. All comments must be received on or before July 29, 2005.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and the DEIS can be answered by Ms. Patti Johnson, telephone (916) 557–6611, or e-mail at *patti.P.Johnson@usace.army.mil.* Please refer to Identification Number 199500412.

SUPPLEMENTARY INFORMATION: River Islands, LLC, (applicant) has applied for Corps authorization under section 404 of the Clean Water Act. The applicant is also requesting the State of California Reclamation Board to seek permission from the Corps Chief of Engineers under 33 U.S.C. 408 to permanently alter federal flood control project levees. The project as proposed would also require Corps authorization under Section 10 of the Rivers and Harbors Act. The project may also require other Federal, State or local authorizations, including bridge permit(s) from the U.S. Coast Guard under Section 9 of the Rivers and Harbors Act.

The proposed project site currently includes agricultural land, forested riparian habitat, and rip-rapped flood control levees. It is in the area known as West Lathrop, which was annexed to the City of Lathrop in 1997. Stewart Tract is an island in the Sacramento-San Joaquin River Delta bounded by the San Joaquin River on the north and east, Old River on the west, and Paradise Cut on the south. Union Pacific Railroad (UPRR) tracks are located along the eastern boundary of the largest portion of the project site. Paradise Cut is used for irrigation and as a flood control bypass channel carrying flood waters from the San Joaquin River to Old River. The area adjacent to the project site is largely agricultural. However, the

Mossdale portion of West Lathrop immediately north of the project is currently undergoing urban development. Developed portions of the City of Lathrop are east of Interstate Highway 5 and the proposed project site.

The proposed project area covers approximately 4,905 acres of Stewart Tract, which flooded in 1997, and surrounding waterways. The project would include work in the San Joaquin River, Old River, Paradise Cut, an unnamed drainage channel, pond and adjacent wetlands on Stewart Tract, for the purpose of rebuilding and strengthening existing levees, constructing a series of setback levees, and constructing residential and commercial development, including recreation facilities, back bays and an interior lake. Excavation and expansion of Paradise Cut would be undertaken to increase its storage and flow capacity. Levees along Old River and the San Joaquin River would be reconfigured and strengthened by the addition of soil on the landward side of the levees to create high-ground corridors along the river edges. A new cross-levee would be build immediately west of, and paralleling, the existing UPRR right-of-way. The applicant asserts levee work along the San Joaquin River and Old River afford the opportunity for back bays which would create limited flood control storage, habitat for various Delta fisheries and sites for recreational facilities, including marinas.

Under the applicant's proposed alternative, approximately 11,000 homes, five million square feet of commercial and retail space and a variety of other community facilities and associated infrastructure would be constructed. The mixed-use development would cover approximately 4,115 acres and include a town center district, an employment center, public service facilities, retail and commercial uses, residential neighborhoods, lakes and water features, schools, parks and trails, golf courses, open space and habitat areas. Two bridge crossings over the San Joaquin River and two bridge crossings over Paradise Cut would be constructed to provide access to and from the developed areas. Water-oriented recreational facilities would include boat docks, ramps and piers. Docks sufficient to provide 921 total berths would be constructed. The applicant also proposes to create approximately 280 acres of open water habitat and 35 acres of wetlands in the central lake.

A Subsequent Environmental Impact Report (EIR) for the River Islands at Lathrop Project was certified by the City of Lathrop in January, 2003. A General Plan Amendment, West Lathrop Specific Plan amendment, rezoning and an Urban Design Concept have also been approved by the City.

A delineation which identifies approximately 379 acres of waters of the United States, including 41.18 acres of emergent wetlands, 55.23 acres of scrub/shrub wetlands, 60.92 acres of forested wetlands, 2.77 acres of pond, and 218.51 acres of riverine/channel aquatic habitat, within the approximately 5,546-acre area surveyed for the project site, was verified by the Corps on January 30, 2004. The applicant asserts that approximately 32-acres of waters, including wetlands, would be lost to project construction under their preferred alternative. The proposed project would also directly and indirectly impact other waters, including wetlands, in and around the project.

The applicant's proposed conceptual mitigation for the project's impacts to waters consists of creation of approximately 140 acres of new waters in Paradise Cut and approximately 85 acres of new waters in the proposed back bays. These would include approximately 46 acres of emergent wetland and shallow water habitat (less than 10-feet deep) for various fish species and restoration of approximately 10 acres of wetlands at the Paradise Weir bench.

The proposed project may affect federally-listed endangered or threatened species or their critical habitat including delta smelt, steelhead, spring-run chinook salmon, winter-run chinook salmon, giant garter snake, riparian brush rabbit, and valley elderberry longhorn beetle. Other special status species may occur in the project area. The proposed project may adversely affect Essential Fish Habitat (EFH) as defined in the Magnuson-Stevens Fishery Conservation and Management Act. Once a biological assessment has been completed, the Corps will initiate formal consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries, under Section 7 of the Endangered Species Act, for federally-listed threatened or endangered species and for EFH that would be affected by the project. The Corps will also consult with the State Historic Preservation Officer under Section 106 of the National Historic Preservation Act for properties listed or potentially eligible for listing on the National Register of Historic Places, as appropriate.

A number of on-site and off-site project alternatives, including the no-action alternative, will be evaluated in the DEIS in accordance with NEPA and the Section 404(b)(1) guidelines.

Potentially significant issues to be analyzed in depth in the DEIS include, but are not limited to, wetlands and terrestrial biology, cultural resources, water quality, hydrology and flood protection, floodplain management, navigation, agricultural resources, transportation and traffic and air quality.

The above determinations are based on information provided by the applicant and upon the Corps' preliminary review. The Corps is soliciting verbal and written comments from the public, Federal, State and local agencies and officials, Indian tribes, and other interested parties in order to consider and evaluate the impacts of this proposed activity. The Corps' public involvement program includes several opportunities to provide oral and written comments. Affected Federal, State, local agencies, Indian tribes, and other interested private organizations and the general public are invited to participate.

Dated: May 31, 2005.

Ronald N. Light,

Colonel, Corps of Engineers, District Engineer.

[FR Doc. 05–11499 Filed 6–9–05; 8:45 am]

BILLING CODE 3710–EH–M

DEPARTMENT OF EDUCATION

Notice of Proposed Information Collection Requests

AGENCY: Department of Education.

SUMMARY: The Leader, Information Management Case Services Team, Regulatory Information Management Services, Office of the Chief Information Officer, invites comments on the proposed information collection requests as required by the Paperwork Reduction Act of 1995.

DATES: Interested persons are invited to submit comments on or before August 9, 2005.

SUPPLEMENTARY INFORMATION: Section 3506 of the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35) requires that the Office of Management and Budget (OMB) provide interested Federal agencies and the public an early opportunity to comment on information collection requests. OMB may amend or waive the requirement for public consultation to the extent that public participation in the approval process would defeat the purpose of the information collection, violate State or Federal law, or substantially interfere with any agency's ability to perform its statutory obligations. The Leader,

Appendix A-3
Public Scoping Meeting Transcript

U.S. ARMY CORPS OF ENGINEERS

SACRAMENTO DISTRICT

RIVER ISLANDS AT LATHROP

PUBLIC SCOPING MEETINGS

DRAFT ENVIRONMENTAL IMPACT STATEMENT

June 29, 2005

Lathrop Community Room

15453 7th Street

Lathrop, CA

Clark Reporting

2161 Shattuck Avenue, Suite 201

Berkeley, CA 94704

(510) 486-0700

Reporter: Freddie Reppond

Clark Reporting
(510) 486-0700

A P P E A R A N C E S

U.S. Army Corps of Engineers
Patti Johnson
Thomas Cavanaugh
Jim Sandner
Lisa Clay
Jones & Stokes
Anna Buising
Steve Centerwall
River Islands
Susan Dell'Osso
Alicia Guerra
Glenn Gebhardt
City of Lathrop
Bruce Coleman
Members of the Public
Dan Coleman
Connell Dunning
Jim Larkin

[THE AFTERNOON SESSION BEGAN AT 2:00 P.M.]

MS. JOHNSON: My name is Patti Johnson. I'm with the U.S. Army Corps of Engineers. And this is one of two public scoping meetings that we're having on the draft environmental impact statement for the River

Islands project. So I just want to go over a few administrative things. Then we'll get right into the agenda.

The restroom is back there. There's snacks on that table over there. Please feel free at any time. And I hope that we have all of your registration forms so that we know who would like to make comments or not. We have two ways we could do this. The first hour we had planned to go through what our permitting process is and our purpose here and the environmental process a little bit and then ask for comments from you all.

These comments will be recorded here today by the court reporter sitting over here. And there are other means that you can comment. We have a mail-in sheet which has my name on the back if you want to mail one in later. There's also the registration sheet -- says on there if you wish to be notified of later meetings, public notices, and so forth. I hope you all checked that box.

Anyway, what we're intending to do is just

keep our presentations short and then possibly, if the air conditioning is not fixed, even shorter, so that whatever comments you'd like to make, you can make them either after each presentation; or if you wish to hold them to the end, that's fine, too, because this is designed so each presenter will have a very brief presentation. And maybe it would be easiest to just kind of have our presenters come up here and identify themselves by name and who they're with.

And the first speaker would be -- did everyone get a copy of today's agenda? -- would be Tom Cavanaugh, who is our section chief with the Corps of Engineers. And maybe we can go through the next. Jim Sandner -- Jim, I just want to introduce people around, so if you can stand for a second.

MR. SANDNER: I'm standing in for Randy Olsen today.

MS. JOHNSON: He's the Randy Olsen of the day.

And giving the overview for the National Environmental Policy Act process is Anna Buising and Steve Centerwall from Jones & Stokes Associates, the environmental consultant on this project.

Then we have Susan Dell'Osso, who is the project manager for the River Islands project here.

And again, the next steps that we are doing to

be taking in this process as we work through the environmental impact statement, will be, again, Steve and Anna. And then I'll just make a few remarks at the end.

So my question to you is, would you rather wait till the end of these presentations to comment or would you rather just raise your hand and comment after each section? Either way. You'd like to hear the presentations first? Okay. If that's all right with you, we will just proceed that way.

MS. DELL'OSSO: Would you ask for the audience to introduce themselves; or is that not a common thing to do?

MS. JOHNSON: If they wish to, when they comment, yes, if they would.

MS. DELL'OSSO: I was just wondering who the people were.

MS. JOHNSON: Again, we do have a court reporter here, so there will be an official transcript of this.

Tom, please, you're going to talk a little bit about the permitting process.

MR. CAVANAUGH: I'm Tom Cavanaugh with the Corps of Engineers. I'm filling in as chief of the Central California/Nevada section for Mike Jewell, who

is away on assignment. But this is a real quick overview of the regulatory program.

With this project, there are actually three Corps authorities that I'm aware of that come to bear. The first is the 408 authority for modification of levees, which Jim Sandner will talk about in a minute. But the two authorities we have in the regulatory program are Section 10 of the Clean Water Act, for which we have to grant permits for work in, under, and over navigable waters. The second is Section 404 of the Clean Water Act, where we regulate the discharge of dredged or fill material in the waters of the United States, which includes wetlands. Basically the goal -- the purpose of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. And, again, permit has to be obtained first.

Now, under the 404 process, when we have an individual permit, we put out a public notice; we conduct an alternatives analysis; and, basically, we look at different ways in which a project might be designed, different places it could be constructed, to allow us in the end to permit only the least environmentally damaging practical alternative, which by regulation is all that we can permit. So we then

prepare an environmental document.

In this case, we're on the path preparing an environmental impact statement for this project, which is the most extensive documentation we do for any project.

So at the end of that process we will make a decision as to whether or not to permit the project. Basically the decision -- in making that decision, what we are going to look at is the compliance with the 404B.1 guidelines, which are originally promulgated by the Environmental Protection Agency; and they guide our consideration of alternatives. If there's a rebuttable presumption to those guidelines that the discharge of dredged or fill material into waters and in particular wetlands can be avoided, that there are upland sites in which that work could be done, the only way we can give someone a permit is if they effectively for that project rebut that presumption and show that there's no way to avoid the discharge.

We also look at -- have a public interest evaluation. We look at factors such as the effects on traffic, on agricultural land, air quality, and a number of other factors.

Let's see -- before we can issue any kind of a permit, a certification from the California Regional

Water Quality Control Board would be required. That's the State who administers that portion of the Clean Water Act. They're looking at the water quality aspects of the project. So we basically work together to -- they separately come to a conclusion, but their decision is needed before we can proceed with ours.

There's a lot more information we have on our website, but that's really kind of a quick overview of what we're doing here. And, again, if there's questions, we can address those later.

Jim.

MS. JOHNSON: I might add that our website is on the public notice. If you didn't get a copy of it, there's plenty up here.

MR. SANDNER: I'm Jim Sandner, the chief of operations in the Sacramento district. And I want to just talk about the U.S. Code 33, 408, that Tom mentioned briefly at the beginning of his presentation.

This particular project involves changes to the San Joaquin River flood control project. There is a portion of that larger project, Reclamation District 2062, that encompasses this whole Stewart Tract. That project has been turned over to the State of California to operate and maintain. And, in turn, they have a subagreement with the reclamation district to conduct that operation and maintenance in the flood control works that surround Stewart Tract.

As a result of this proposed project, there are changes that are going to be made to that project as it relates to the flood control system. And the Corps of Engineers has a requirement under the U.S. Code to apply for permission from the Secretary of the Army to make those changes. The Secretary of the Army has delegated that authority to the chief of engineers in Washington, D.C. And his decision will be based on a recommendation from the Sacramento district district engineer.

Local flood protection projects -- the federal interest that we are involved in is ensuring that the federal government's investment in flood protection is protected. And we work with the State of California in an inspection program to ensure that those interests are protected under the 408 procedure. What we will be doing is working with the State of California and the project applicant to look at that proposed project and ensure that the changes that they are making are not going to impair the usefulness of the protected works that currently exist.

The other aspect of 408 deals with some of the things that Tom talked about; and that's that the

proposed changes will not be injurious to the public's interest. So we are going to be participating in the

EIS as well to ensure that the various alternatives are reviewed and that the public interests are protected as it relates to the flood control aspects of this proposed project.

The State will play a very important part in the 408 process because they ultimately have the authority as to whether or not the project will be approved. And the state reclamation board will make the final determination after the chief of engineers has provided permission back to the State of California to all the flood control works. So we have asked the applicant, the proposed developer, to work with the State of California and with the Corps in that process of coordination and permission.

And, again, I'll be happy to answer any questions that you folks may have about this particular process after the other presenters have an opportunity to speak. Thank you.

MS. BUISING: Hi, everybody. Thank you for coming. Patti's already introduced me. But just in case anyone didn't catch it, I'm Anna Buising. I'm with Jones & Stokes. And I'm leading the team that will be supporting the Corps in preparing the EIS for the River

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Island project.

I feel a little bit like I'm preaching to the choir here because I know that a lot of you are familiar at least with pieces of the project and have been kind of watching this process. And I know that probably a lot of you probably know quite a bit about the NEPA process as well. But I want to spend just a few minutes, so bear with me if I'm telling you a lot of stuff that you already know. I want to spend just a few minutes kind of laying out the framework for what the National Environmental Policy Act requires for this project, for where we are at this point, and where we're going from here.

So you probably all know that when the National Environmental Policy Act was passed, one of its primary goals was to ensure that federal agencies were required to consider and disclose the environmental effect of any activity that they undertook. And that includes not only activities that are taken directly by a federal agency but also projects and actions that are permitted or funded or receive some sort of federal agency oversight. So that includes private proposals like the River Islands project.

Another very important part of the NEPA process -- and really why we're all here today -- is

that the intent was that federal agencies would be required to disclose and engage in dialogue with the public about the potential environmental effects of their actions and activities that they oversee, fund, or permit. And, also, that they would seek solutions for any adverse environmental impacts as well as identifying any potential environmental benefit.

There are a couple of avenues under NEPA to address environmental impacts. Those include looking at a spectrum of potential alternatives that would achieve the same purpose and need that's been identified for the proposed project and also identifying means of mitigating or avoiding or compensating for specific impacts that have been identified.

So in terms of the process, this is kind of a road map through the NEPA process. And we also have this as a handout in case you haven't already gotten a copy. They're up here on the front table. And please do help yourselves.

What's important, I think, probably, for our purposes today, are that we have highlighted the opportunities for public dialogue and engagement in orange. So these are the steps that I really want to focus on. But let's walk through the whole framework, starting with the process.

Of course, we already know that the lead agency for this project will be the Corps because of a very important permitting requirement under the federal Clean Water Act. And we have already been through the steps that have identified that, yes, there is a significant potential for significant environmental effects. And, as a result, an environmental impact statement will be required, so sort of the full NEPA process. And, of course, you probably all saw the notice of intent that came out recently announcing, as the formal announcement, that the Corps will be going through the EIS process.

So we're now at this first orange step, which is the scoping stage. And the purpose of scoping --

again, you probably know, under NEPA is to -- for the lead agency to solicit input from the public and from other interested agencies and jurisdictions about the issues that should be covered in the environmental impact statement; and also potentially about what a reasonable range of alternatives to consider would be.

So once we go through the scoping process and have taken all of the feedback that we get from you today and in the second meeting this evening, then the next piece is to ensure that we have a full and reasonable range of alternatives on the slate for

analysis in the EIS, because NEPA requires that the lead agency analyze and compare the effects of alternative modes of achieving the same purpose and need as a basis for good decision-making in the public interest.

So the Corps's goal -- and you'll see kind of in the fine print over here and down here -- the goal and the hope is that we will have that slate of alternatives established by the end of 2005. And that will set us up to move forward into the environmental impact process that funnels into preparation of the draft EIS document, which we hope to have ready for review by November of 2006 -- so a little more than a year out. And at that time the draft will be filed with the U.S. Environmental Protection Agency. The EPA has a very important role as a quality assurance reviewer to ensure that the EIS meets the NEPA standard and that the job of analysis and disclosure dialogue has really been appropriately performed.

The other really important thing that happens at that time, of course, is that the draft document -- and I really want to stress that word "draft" -- is circulated for public review. And that's the second really big opportunity for public engagement, dialogue, and comment on the project and also on the analysis of its potential environmental impact, including both

adverse impacts and potential benefits. So we anticipate -- we hope that that will be happening in November of 2006. And as a follow-up sort of corollary to that process, the Corps, as the lead agency, will be holding a public hearing, which will be another sort of live, up-close and personal opportunity to deliver feedback in person.

All of that feedback, then, that's received on the draft EIS -- and there will be a lot of avenues for comment -- in writing, in person, by e-mail -- we can talk about some of those as we move forward -- all of that feedback will be wrapped into preparation of the final environmental impact statement. The Corps, as the lead agency, is required to amass all of that comment, to give it due consideration, and then to respond to it in writing. And all of the commentary and all of the response becomes part of that final EIS that then is made available to the public again.

So the final EIS is filed with EPA. EPA serves as the repository for all EIS's and any other NEPA documents. And then it will also be circulated for another round of public review. So this is another opportunity for public comment on the project and also on the quality of the analysis, which, of course, we hope will be good. We certainly will do the best we

can, but we really look forward to your input and your commentary to help guide that process.

So the final EIS will be circulated; that next round of commentary then will be collected, brought in house. The Corps is required to consider it and take it into account in making a decision about whether or not to adopt or sort of formally ratify that final EIS document, which includes, of course, the text of the draft; all of the commentary that was received; and, also, the Corps's responses. Based on all of that input -- those multiple generations of analysis and public comment and review and consideration -- the Corps, as lead agency, will make its decisions about the project and the permitting -- specifically, the permitting decisions that the Corps has to make -- and then will ultimately prepare the formal record of decision that's filed with EPA to sort of finalize the process.

So in a nutshell, that's the quickie outline of what we have coming up over the next couple of years. And like the rest of the presenters, I'll be happy to answer any questions you have about the process or what NEPA requires, the avenues for comment -- any of that stuff we'll be happy to address in more detail when we move forward. Thanks.

MS. DELL'OSSO: I'm Susan Dell'Osso. I am the project director for River Islands at Lathrop. And who will possibly be helping me if I need him is Glenn Gebhardt. He's our engineering manager. And we also have in the audience Alicia Guerra, who is our legal counsel from Morrison & Forster.

Patti asked me to give a very brief overview about the project and its design and some of the impacts on what's being considered in the EIS. I apologize that this map is so small, but it seems to be the only one that I can really hold up. I don't think anyone in the audience can see that.

Just to put you in context, this is the 205 freeway. We are just at the 5 -- going up to the 5. This is Louise Avenue right here, where everyone probably got off to come to this meeting. We're located in the building right over here, not at the new city hall, which would have been nice and air-conditioned. But we're over at this new building over here. This is the San Joaquin River, which goes up to Stockton and goes all the way up to Stockton -- the Old River system. And then we have a flood bypass called Paradise Cut that borders the south of the project.

We have two physical entrances into the site right now. We have an at-grade crossing that will

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actually become a two-lane, fairly large road coming into the the project as the initial entry. We also have an existing bridge that provides access across Paradise Cut down to the 205. So we have two physical accesses into the project right now.

There will also be an additional bridge coming over the San Joaquin right here, which will be an extension of Louise Avenue. And then we have a freeway bypass system called Golden Valley Parkway, which will trigger two additional bridges. And there will be an expansion of this bridge in the future as well.

The project is about five thousand acres, plus or minus. It's eleven thousand housing units and about four and a half million square feet of commercial space.

One of the things I definitely want to point out is the wetland that we have on site.

Back in '96, we had an original wetland delineation done. And it was reverified in 2004. But, as you can see, the predominant wetland is a drainage ditch that goes to the center of the site. We have about 370 acres of wetlands altogether that have been delineated. The bulk of those, obviously, are in the river systems. We do have one wetland that comes through the middle of the project site. This is the current drainage ditch that receives all the

agricultural water. But with the exception of that drainage ditch, the bulk of wetland happens down here on Paradise Cut. And as I'll explain in a minute, Paradise Cut is really the mitigation area where we're addressing the brush rabbit habitat and some of the shaded aquatic riverine habitat. So all of the impacts that we're doing in Paradise Cut are either driven by flood protection or endangered species mitigation.

One of the things I also want to point out -- and this is kind of a State issue but it's critical for us -- this is the primary and secondary zones of the Delta. And this is critical, because back in 1992, the State legislature issued a designation of primary zone. And in a primary zone development is basically off limits. Secondary zone -- you can see we are just at the southern boundary of the secondary zone. Secondary zone -- we're in the pink -- so secondary-zone development is allowed. And it was based on that designation in 1996 -- 1992 -- that we moved forward with the development process that we're doing right now.

One of the fundamental features -- and I believe driving a lot of the EIS requirement -- is what we're doing with our levee system. As Jim pointed out, we have the federal levee project that protects the Stewart Tract. And the Paradise Cut is a flood bypass

that is part of that federal levee system. We are proposing to build levees that are 300 feet wide. They're called super levees. And the proposal is to basically take the dirt out of the middle of the project, use that dirt as fill material to expand and have super-wide fat levees bordering the project site. One of the critical things that we're doing is -- again, this is the San Joaquin River and this is the flood bypass -- there's a rock dam here that controls the flow of water into Paradise Cut. In about a four-year storm, water will actually flow over that weir and go into Paradise Cut. What we decided to do and -- really, it was driven by the fact that in 1997 this area did flood -- and that caused some of our neighbors to think that we were the release valve for flooding events -- hundred-year flooding events. What we decided to do was to enlarge Paradise Cut and make it handle more water during the flood flows than what it's currently doing.

In fact, Paradise Cut was originally designed to carry about 15,000 CSF. And right now it's carrying, during flood flows, about 12,000, depending upon what modeling you're looking at. So it's really not operating like it was originally designed to do. So one of the primary things that we're doing is fixing the issues in Paradise Cut so it will handle more of the

designed flow. So we are doing that by -- there's a bench right here about -- about a 20-acre bench that's blocking the flow of water coming through. So when water does flow over the weir, it's being blocked by this bench. We are cutting down that bench by about five feet. And that's actually a temporary impact on wetland. We're cutting down that bench by about five feet. It will until induce more water to come in that will flow into Paradise Cut. There's a bottleneck here that you can see. We're actually setting that levee back by about 150-200 feet, depending upon what the final models show. And then as we go into Paradise Cut in order to not cause any increase in elevation to the south of the project, we're setting back our levee system to the north into our project area. This is about three or four miles of levee setback. And, again, this is an alteration to the federal flood system, which is a fairly significant change. And I think that's what's causing the EIS requirement.

One of the benefits of doing this is that we have a riparian brush rabbit that lives in this area. And right now when Paradise Cut floods, there's nowhere for that rabbit to go up to. So they basically scamper up to the top of the levee; and the levee has no vegetation on it, because it's just a typical

50-year-flood protection levee that has no vegetation and has to be cut clear. So what we're doing is, when we set our levee back -- and we are creating about 250 acres of new waterways -- we're going to leave the existing levee remnant in place and plant it so it can be used as high ground when the area does flood. It will provide an area for the riparian brush rabbit to go up to. So this is a fundamental feature of our site, this high-ground refuge for the brush rabbit.

Another thing we've done is -- even though we haven't had formal consultation with Fish and Wildlife, we have had informal consultation -- we have about a two-acre impact from these bridges coming in. And we have agreed with them to set aside the entirety of Paradise Cut, or about 600 acres, as habitat to help for the recovery of the rabbit. So that's one of the features that we're doing down here.

Another thing that we're doing is, because we have this fat levee system, we are working with the State and with the Corps to be able to plant the outside of the levee to create vegetation on the water side, because if you have a typical 20-foot levee top, you really can't afford to have any vegetation, because you can't risk the undermining of the structure. But by having this super-wide fat levee, we're proposing to put

vegetation on the outside and create shaded riverine habitat for the delta smelt, Sacramento split-tail, and all the other fish that reside in these rivers. So we've got to have a fundamental riparian habitat high-ground refuge for the brush rabbit down here and the shaded aquatic riverine habitat that will surround the entire site.

One more thing that we're doing is this lake is internal to the project. It does not have any connection to the outside. But in working with the regional board, we have worked with them to identify key locations to put wetlands to help with the stormwater cleanup. So we have a series of BMPs. We have grassy swales; we have wetland; and we also have a very sandy soil here. So when the water does go into the lake most of the time it will just seep through the soil and get out through the river system. So we have three different BMPs. But that is effectively providing cleaner water to the outside river edge that will discharge into the river than we are currently discharging for agricultural purposes.

Another thing is that under the agricultural use we are taking in a lot more water from the river than we will under urban, because we really are not using the river water for potable water, obviously.

We're only using it to maintain equilibrium to maintain a balance in the lake system. So we have much more limited uses of the riparian water than we will, as we currently do now under "A."

So that's kind of it. Do you have any questions? I'll be happy to answer them.

MS. BUISING: I just want to talk really quickly about what the next steps are in the EIS process. Of course, you already know. You are here. We are in the scoping process now. Our next task will be to go away and work as a team to develop a range of alternatives for EIS analysis. And the Corps hopes and intends to come back to the public for additional input with a follow-up meeting to share the results and possibly solicit more commentary on the alternatives as they are being developed.

Patti, did you want to talk a little bit about when you see that happening?

MS. JOHNSON: If you're talking about the range of alternatives, probably around in that time frame in there. And the screening process.

MS. BUISING: Right. The intent would be to have them wrapped up and kind of lined up to funnel into the EIS process by the end of 2005. So kind of in the latter part of this year you would envision coming back for another meeting?

MS. JOHNSON: Uh-huh. If people are interested in doing that. The screening process means that all of us will be looking at a range of alternatives and trying to eliminate those that obviously don't fit under the NEPA category of being fair and reasonable. And we don't know what those alternatives are at the moment. We're just at the beginning of this whole process. They could include an off-site alternative, for example. Different configurations of on-site. We just don't know. But the screening process will work through that and eliminate some obvious ones that won't work. And those will be presented to the public as well as ones that we narrow down to an acceptable range.

MS. BUISING: Another thing that we had talked about -- and we didn't know if we really wanted to put out there for public awareness is that this process of developing and screening the range of alternatives for EIS analysis is going to be very clearly integrated with the analysis that's required under the Corps's Section 404 permitting review process. So those two processes will kind of run in parallel or in dovetail through the end of this year. And then, once that range of alternatives has been established and the Corps feels

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that they have what NEPA requires in that regard, then our next step will be to move forward with the draft EIS process.

And again the hope and the goal is that it will be possible to circulate that draft EIS in the November 2006 time frame. And, of course, we will be coming back to you to let you know how the timing is proceeding.

And please make sure that you're on the mailing list.

DAN COLEMAN: Dan Coleman, home builder. Yes, a couple of questions. Actually, the first one is on this alternative analysis. This project has been litigated pretty extensively. And obviously there is an existing environmental document. I'm not familiar with the NEPA process. But in a normal CEQA document you have a whole range of alternative analyses that have already been examined ad nauseum and have actually been litigated. So what happens to all that?

And then the next question, in terms of the alternative analysis -- or the alternatives that you're looking at -- where are you at the end of the process with respect to the Corps' alternative analysis? So, in other words, are you actually required at the end of this NEPA process to go back through and do an

alternative analysis to get a permit?

MS. BUISING: Let's do those in reverse order. Let's talk about the Corps process first; I'm going to defer that one to Tom.

And then let's come back to your question about what happens to all that analysis that was done for the EIR and how that relates to what NEPA requires for the EIS.

MR. CAVANAUGH: The alternatives analysis that would occur in developing the EIS would be the range of alternatives we consider in making out permit decisions. So there wouldn't be -- we wouldn't have a subsequent alternatives analysis to the EIS.

MS. BUISING: So your other question had to do with --

DAN COLEMAN: I've been through alternatives analysis after the whole CEQA process, so where does this leave you in the process?

MS. BUISING: The short answer is that all that alternatives analysis that went into the EIR isn't going to disappear. We have learned from that and built on it. What's really important at this stage is that the Corps needs to make sure that the requirements of NEPA are also satisfied. And those differ a little bit from what the State requires for a CEQA document. And,

also, because of the 404 nexus, it's really important that that alternative process satisfy both what NEPA requires for the EIS and also what the Corps needs to make a permit decision under 404.

And one of the things that's really important just in terms of the level of analysis -- you mentioned the EIR analysis and sort of the process that we've already been through to get to the point we're all at now. NEPA requires that all of the alternatives be analyzed to an equal level of detail to the extent that that's feasible. And that's not required under CEQA.

So the NEPA analysis has to go a little bit farther in that comparison of alternatives that's intended to underpin decision making.

So that's a piece of what has to happen for the NEPA process that goes above and beyond.

DAN COLEMAN: Actually, I don't agree with you on that, because, once you start down the litigation road, you actually are taking a pretty decent look at every alternative you put on the table if you have good representation.

MS. DELL'OSSO: As the Applicant, but as a public member and who is setting precedent for other projects, we are having a little bit of heartburn about our project purpose, because the way our project purpose

reads, you can literally take this -- it doesn't have anything about water-oriented or -- if you look at it, it's highly amenitized. It doesn't have any of that stuff in there.

And the concern I have is when we look at alternatives where you could take five different residential projects in Tracy and one commercial project in Ripon and put it together as an alternative that would be equivalent to this project -- and I still want to get clarification that the alternatives we're looking at are large, massive-scale developments -- and you may want to pitch in on this, Alicia -- but it seems ludicrous to me that we could actually be breaking up the project and looking at subsets that could happen in different communities throughout the area and not as one integrated whole, because we have a requirement -- and the City can speak to this -- but we have a requirement for a jobs-housing balance to provide a certain number of jobs per each of the houses, to provide head-of-household jobs -- just a number of things that are all integrated.

BRUCE COLEMAN: I would like to speak to that. Bruce Coleman, director with the city of Lathrop.

One of the things that the city council was looking at when they approved this project back in 2003

was the fact that this would be a balanced development that would generate employment. That's a very, very important issue in San Joaquin Valley -- and the need to produce really household income levels so that we don't have as much commutation going on in the Bay Area so we can increase the wage levels. So a really important component to the city council is to create an employment center. And one of the requirements of the development agreement that the City entered into on this project was to ensure that every one of the houses in this development would pay $5,000 in economic development fees to the City of Lathrop. Eighty percent of that must be filtered back in order create employment in this particular project. So the employment component is extremely important to Lathrop as well as the diversity of housing amenities. These were really critical elements when the city council held its public hearings on this project. I just want to mention that.

MS. BUISING: Thank you. That's very helpful.

And I want to reiterate that all of this that's coming out is going to feed into the alternatives of the development process. So if anyone else has perspectives or concerns that you feel ought to be on the Corps' radar screen as we go forward with the alternatives development, please bring them forward or

share them with Freddie or send them to Patti by e-mail or send them on a comment card and please do let us know.

ALICIA GUERRA: The only thing I would add, from a process standpoint and the effort to factor in the 404(b)(1) process or the NEPA process is that at first the Applicant has the burden to meet the Corps' presumption under the 404(b)(1) guidelines. And as part of that process the Applicant will be providing information about alternatives that we hope the Corps would take into account in its CIS and not start anew with a brand-new set of alternatives that doesn't yet reflect the information.

I think some of the concerns that you've heard from the City of Lathrop and the Applicant are just aspects of the 404(b)(1) analysis. The alternatives analysis that the Applicant is preparing, which the Corps will have that information to perhaps assist in the preparation of the EIS.

MS. BUISING: Thank you.

DAN COLEMAN: Well, suppose in your process you actually take an alternative that is a superior alternative and it is, in fact, similar to a CEQA

alternative? Where is the Applicant at that point?
MR. CAVANAUGH: Actually, NEPA does require

that we identify the environmentally preferred alternative towards the final EIS stage of the process. The Corps is not required under NEPA -- we're just talking about NEPA, not 404 -- to select the environmentally preferred alternative. All they are required to do is identify what alternative they think is preferred from an environmental standpoint and why and document that in the administratively recommended process.
DAN COLEMAN: Is that in a situation where the Applicant has started to negotiate -- or maybe negotiating in mitigation -- or what happens there?
MR. COLEMAN: Well, in order to get back to the City's preferred alternative, the one that was voted on, if you, in fact, have something that is somewhat different, what does one do to -- you would normally do an alternative analysis process. I'm familiar with that. So what do you do at the end of this NEPA process, given the fact that it's coming out and the Corps is going down a little bit of a different trail than the City of Lathrop.
MR. CAVANAUGH: I'm not sure, because I haven't been involved in this for a long time, why it didn't happen here. But for the most part with the project we're working on now, where we have requirements

for an EIR as well as an EIS, we're trying to bring them into being as a joint document so that you don't end up with that potential conflict in the end. And, again, I can't speak to why it didn't happen here.

MS. DELL'OSSO: I'm sorry. I have to speak to that. We still cannot believe that an EIS is required, because this project is, in our minds, fully self-mitigating. I'm glad this is getting on the record, so it's time for us to say it. We have, again, instead of two acres of endangered species habitat -- instead of two acres of impact on riparian brush rabbit, we're setting aside six hundred. We have three hundred acres of wetlands, plus we have thirty acres of impact, only eight of which are permanent. And we're building forty more permanent wetland.

There was never an EA quantity done in that document why we needed to do this. We were only told that the project was so big that an EIS is required. And that's something that we have gone back and forth -- and poor Alicia's heard it a thousand times. She probably doesn't want to hear it anymore. But we still cannot believe -- if the [INAUDIBLE] issue wasn't an issue and moving the levee wasn't an issue, the project stopped mitigating. We thought we were doing something phenomenal, which was designing all the mitigation into

the project description.

You will not find, I believe, that we're going to have to go offsite to mitigate anything. The project is self-mitigating in and of itself. So I think we'd still like to know why the EIS is required.

And I put that to you because that comment about an EIR combined with an EIS -- well, we did the EIR and designed the project this way. And we had only beneficial impacts when it came to flood protection or water quality or endangered species. Someone should look at the EIR -- the City wasn't wrong when they adopted it, so we're still flabbergasted we need an EIS. So that's why you don't see a combined one together, because we absolutely presumed [INAUDIBLE].

MS. GUERRA: There's also an additional point of clarification on that, which is that, when you're going through the State CEQA process with the City of Lathrop, blend that with representatives from regulatory to find out what the NEPA requirement would be for this project in case there were an opportunity to combine the EIR and the EIS. And at that time that it was -- before issues were addressed related to the 408 determination. So I recognize things change here. But at that time it was regulatory's view that an EIS would not be required. And it wasn't. Based on preliminary information -- it

changes -- but I guess what I'm saying is that question was investigated and early on in the process when we could have perhaps changed things. And the indications that we have received were that it was okay to go on the path that we were going on. That's why we're doing it now.

MR. CAVANAUGH: That issue actually came up in the beginning, when this was proposed as Gold Rush City; and there were some misstatements as to the need for an EIS, but I don't know what happened.

MS. GUERRA: It actually happened during the draft EIR review for a subsequent EIR for River Island and subsequent to Gold Rush City.

MS. DELL'OSSO: And a clarification. Gold Rush City was just a regular 20-foot levee around the whole project. Didn't step back Paradise Cut levees -- well, actually, the setback along Paradise Cut was something that was identified in the comprehensive study. So, again, we thought we were being aggressive by taking away 300 acres of our land to step back levees to help the comprehensive study.

MS. JOHNSON: Are there any other comments? because this is to hear public comments as well.

Do we have any other public comments or questions?

At this time, I'd like to just say what you've heard this afternoon is that we have and will have several opportunities for the public to continue to participate in this project as it works through the alternatives and review of the draft EIS and so forth.

And your comments are always welcome. You can speak directly to the court reporter. Again, we have comment sheets that you can mail in up here if you want to think about it for a while. You can e-mail me. You have till July 29th to get your comments in on this particular issue, which is what are the issues that you would like to see addressed in the EIS process? Do you have any, in particular, in mind? We have a very broad range of topics, but if there's something specific you'd like to see addressed, please let us know we haven't covered it, either in the public notice, the Federal Register notice, or today. And that's what our purpose is today. We will be doing this again this evening, too.

CONNELL DUNNING: I have one question. Connell Dunning, Environmental Protection Agency. You had mentioned for your proposed action that the lake is not connected. But then you said something about BMT. So when water does come off the site, what would happen to that; so it is connected?

MS. DELL'OSSO: It is connected, geologically, underneath. So we're not saying that it's not waters of the U.S -- we're not trying to get creative. What I was trying to say is there is no -- like, you couldn't take a boat from the lake to the river is what I was trying to say. But we do acknowledge and we talked to the regional board -- that's why we have all the wetlands around the lake so that anything that drains into it has gone through the BMP process.

MS. JOHNSON: Any other questions or comments?

I'd like Lisa Clay, who is our office of counsel, respond to a couple of comments that were made.

MS. CLAY: I'll just address a couple of things that Susan raised regarding the Corps' decision to prepare an EIS.

Several issues that we looked at on here -- we thought there were some significant issues regarding flood protection and flood control, which Jim Sandner mentioned when he spoke earlier. There are some specific issues regarding impacts to endangered species, impacts to navigable waterways; and it explains the basis for our decision to Susan in writing several times. So we have had that dialogue. And I understand we disagree on the ultimate conclusion, but we have attempted to explain as best we can the basis for that

decision -- the basis for that decision is available to anyone who might be interested. You can see copies of our correspondence that we have on file.

And the other issue you raised, Susan, was the alternatives analysis and the fact that our stated project purpose is different from the project purpose that you put forth. And it's true the Corps did pare down the project purpose quite a bit, but we tried to retain what we thought were some of the key elements. And one of the key elements that we did retain was large-scale mixed-use development, so when you're looking at project purpose that will drive your alternatives analysis. If you're looking at a large-scale mixed-use development, probably several small-scale single-use developments spread around in a large geographic area would not likely satisfy that project purpose.

So those are the kinds of things we're going to look at when you're developing alternatives. You want to look at things that actually meet the requirements of your project purpose. So I think the example that you gave, Susan, would not likely fall within the context of the project purpose as we stated it. We've discussed that quite a bit with Alicia; and maybe she might share with you some written discussion

that we had on that.

MS. JOHNSON: Anyone else have questions?

[AFTERNOON SESSION ADJOURNED AT 2:18 P.M.]

[THE EVENING HEARING BEGAN AT 7:22 P.M.]

JIM LARKIN: What is this going to do to the houses across the river? Is it going to protect us in any way? It's going to make us get dust and all that kind of stuff? Is there anything in this about the dust? What's going on with that?

MR. COLEMAN: Maybe I can explain one component of this. I'm Bruce Coleman. I'm community development director for the City of Lathrop. This is not a City meeting. The City -- it's the Corps of Engineers, the federal Corps of Engineers environmental meeting.

But just to help understand the process, that project has been approved by the City. The city council went through a very, very extensive review process, did what's called an environmental impact report, an EIR, which is different from what the Army is doing.

And when we looked at the development of this property in 2003, the city council, after holding hearings and whatever, approved the development, which consists of 11,000 housing units; an employment center with four million square feet of space in it; a

downtown; and a tremendous number of amenities and parks. So the project itself has been approved by the city, so the land use -- what we call entitlements -- the land use approvals have been given. So you will have, under that approval, neighbors.

But what I think the Army is looking at now is the issue of getting a permit for levee work and that kind of thing.

MS. JOHNSON: Well, there are --

MR. COLEMAN: And other things I can't explain. And I wouldn't try.

JIM LARKIN: How did that ever get approved, 'cause that's right in the flood plain. It's a flood plain. It flooded.

MS. DELL'OSSO: Actually, do you have that map? It's not in a floodway. It's in a 100-year flood plain, but this map is really important. This map shows in 1992 the State identified areas that were eligible for development and areas that weren't. And in this area of which Roberts Island, in yellow. The yellow area is off-limits for development, pretty much. It would be pretty hard to get anything developed in the yellow area. That's called the primary zone of the Delta.

And the secondary zone, which at one point all of this land was in the 100-year flood plain -- a lot of Lathrop, a lot of Tracy. All of the land that's in pink has been identified as okay for development, just to put it in simple terms. That designation was made in 1992. You say it's in a flood plain, but it's not in a flood way.

JIM LARKIN: I remember it flooded twice.

MS. DELL'OSSO: It flooded in the '50s and in '97. But what happened when it flooded, it flooded off of our site. It flooded down the RB-2107 area, which is the south; and then it -- so what happened, when it flooded, as you probably know, it flooded down here. It impounded water in this area. And then what happened is the rail line wasn't strong enough, 'cause it's not a levee, so it busted through. So it's always flooded in this area. And then we have taken on the neighbors' flooding problems. This is a separate reclamation district in this one. So right now this is protected. It's never broken down. It's only broken on this rail line; and it's not a levee.

JIM LARKIN: Well, years ago, it did. I'm going back to --

MS. DELL'OSSO: Well, let me explain --

JIM LARKIN: My family has been there over a hundred years. There was no levees here at one time.

It used to flood all the time over there. It was a big flood plain years ago. That's where the water went.

MS. DELL'OSSO: In the 1950s, when the levees were built, it was taken off-limits for flooding. So the levees were built in 1950.

And as it stands right now, basically, on the Jones Tract Road, for example, the water at Jones Tract is higher than the ground at Jones Tract; so those levees are always protecting. But this year the water has come nowhere near the height of the land. And I think generally there's like an eight-foot separation where the water on average -- is that right -- is lower than the height of the land.

JIM LARKIN: Are you guys going to clean out Paradise Slough?

MS. DELL'OSSO: What we have proposed is Paradise was the federal flood control bypass. It's supposed to flood in Paradise; it floods all the time. It's supposed to flood in, like, a four-year storm. It's not operating like it was originally designed, so it's not carrying as much water. It's too narrow in places. So what we're proposing to do is clean it out, open, open the bottom up, including on our property here. This waterway you see here is really farmland right now. So we're actually going to make it wider in

our area, too. So the idea being that when it floods in '97, it actually flooded after the peak storm had passed. If we had been able to take some of that peak water and keep pushing it down Paradise and shoved it all the way down to Grant Line, then that would have had less pressure on the San Joaquin River all the time. So instead of possibly -- it didn't flood in '86 -- '86 was the big one? '83?

Technically, we didn't flood in '97. What happened is they flooded and then it went through this rail line that is not supposed to act as a levee. But if we take water off the San Joaquin at all times during a flood and put it down Paradise Cut, all of our modeling shows -- this is something that these guys are verifying -- all of our modeling shows that there's going to be less water in the San Joaquin River during a flood at all stages.

So that's -- our thought was by taking the land out of the flood plain -- because we met with all our neighbors up here and some of the guys on Roberts Island.

JIM LARKIN: A flood plain through Roberts Island, if all these houses were to be built, they would just open it up and let it go if high water comes so it won't break on the houses. That's not good for us.

MS. DELL'OSSO: No. That wouldn't be good for you at all.

JIM LARKIN: Well, that's the floodplain in the '90s, right?

MS. DELL'OSSO: Originally, we weren't going to do anything at Paradise Cut. We were just going to flood-proof it. And now we're making these combinations to make Paradise Cut wider and make the weir pretty much operate better. So what we're showing is this area is out of the floodplain and hoping the Army Corps will conclude, when they're done with their process -- that was what the City concluded in their process. But that at all times everybody is better off because of the improvements, say, here.

MR. GEBHARDT: We can't make any of those improvements until we get through the Army Corps; that's why we're here, just trying to get through this process. The City's gone through all the details. But until we get through the Corps' process we actually can't go make the improvements we're trying to do.

JIM LARKIN: You guys have a spot over there where you made the levee. That's going to be houses? The houses are going to be sitting on that levee bank?

MS. DELL'OSSO: Back from it, yeah.

JIM LARKIN: Are they going to be on it, too?

MS. DELL'OSSO: Yes. That's the plan.

MR. GEBHARDT: When you talk about, why would someone do it when it's in the floodplain, that's why the intent is to take it out of the floodplain, just like the rest of Lathrop was taken out of the floodplain, by fixing that levee that went all the way to Stockton. The idea is to improve the levees and actually put a 300-foot wide levee and put some homes on top so in that area it won't flood.

JIM LARKIN: People, when they were building in Lathrop over here, said they don't know why they're building 'cause that levee is not strong enough for them. It will never be strong enough. The water comes from underneath.

MS. DELL'OSSO: That's why we came up with that design of the fat levee because of the seepage, 'cause we don't want our residents to have seepage. There's 3,200 homes going in right here. There's another 6,800 homes that have just been approved up here. So there's about 10,000 homes going in right here.

JIM LARKIN: What the people in Lathrop told us is if the levee breaks it's going to go south. When they bought the houses, people told us the water is going to go south.

MR. GEBHARDT: They're wrong.

JIM LARKIN: They're in a hole down there. They're in a big hole. That was 18 feet deep back in the '50s, with water.

MS. DELL'OSSO: What they have is they're actually -- these areas up here are actually out of the hundred-year flood plain.

MR. COLEMAN: That's what the City has to consider is what FEMA basically tells us. And they keep repeating the same thing --

JIM LARKIN: Well, they build the levees that in '97 almost broke over here. They okayed it; it still didn't work.

MR. COLEMAN: Property owners have property rights. And the City has to be very mindful of those property rights. And those applicants have come in and proposed development which is not on the flood plain, according to the federal government, so the City imposed a number of conditions on those projects, including a variety of engineering requirements on how to deal with water coming out of the property from drainage and what have you.

And the same thing is true in that new area which has been added -- about 6,800 homes north of Louise, past Lathrop Road. There's some very

sophisticated engineering that has to be done as part of the conditions of the project. And just as this project is conditioned on its right by the city council to -- they have a number of conditions about being taken out of the flood plain itself; and those conditions have to be met before this development can occur. So the City has recognized the rights of these property owners to petition the City for development opportunities. And the City went in and did extensive environmental and engineering reviews and made various requirements on this project so the development wouldn't be allowed to occur -- it could only occur if the conditions are met.

MS. DELL'OSSO: Our proposal, with those super-wide, fat levees -- our levees are high enough right now that they provide not only 100-level of flood protection but 200-level -- 200-year-level of flood protection, which -- are you a farmer?

JIM LARKIN: Yes.

MS. DELL'OSSO: So you know tons about hydrology. So you know if a 200-year storm ever happens in this area, it will never make it here, because everything will break upstream and it will be flooded.

JIM LARKIN: It's still going to have to come down here. Do you think the levee will hold it that long?

MS. DELL'OSSO: Well, what's scary is we're being built at twice the standard. Our levees, the way that we designed them -- and, again, this is all subject to the Corps' analysis -- but we're going to be like the island in the storm here.

JIM LARKIN: But when the [INAUDIBLE] you guys took all the water and saved us.

MS. DELL'OSSO: That's why it's really important to understand what we're doing here, because it's better for you for us to always take more water -- to fix Paradise Cut and always take more water.

JIM LARKIN: But some of the farmers down there are complaining, because they're going to get more water down there. You're just putting the water someplace else.

MR. CAVANAUGH: So one of the main things that I think I'm hearing that you're wanting to see is an analysis of, without the development and with the development and what is the change in the hydrology upstream and downstream, right? That's what you would like to make sure is analyzed?

JIM LARKIN: If it does get higher,, like in Lathrop and Stockton, it will go breaking on Roberts Island in '97. We were afraid it was going to flood.

MR. GEBHARDT: There were lots of rumors where people wanted to break it.

MR. CENTERWALL: You also mentioned some dust issues.

JIM LARKIN: Yeah. And are farmers going to be changed with dust problems?

MR. CAVANAUGH: Well, you have a buffer.

MR. COLEMAN: The City has a right-to-farm ordinance; and so there are various factors there. It is a different jurisdiction; you're in the county; this is in the City limits. But we have to, as I recall, there's requirements that homeowners have to be modified of -- that people have a right to farm in this area. Farming is going to continue on Roberts Island. That area is not going to be developed. As Susan was saying, it's in a different area of the Delta. You're in the primary zone of the Delta; and you can't develop it.

This is in the secondary zone; and it's long been recognized that the secondary zone would be developed. And the City has basically indicated since the '91 general plan that this area would be urbanized. It's long been recognized that Stewart Tract was going to urbanize by the City, but at the same time the council was very, very focused on the need for a right-to-farm ordinance and that kind of thing.

So will there be any complaints? Sure, there

will be some complaints, but you have the right to farm.

JIM LARKIN: Are there going to be crop dusters and all that stuff -- and spraying?

MS. DELL'OSSO: The river is how many feet wide there?

MR. COLEMAN: People are worried about high-rises in San Francisco. Seriously, we're going to continue to have urbanization in these areas. We are trying to get to something more affordable.

JIM LARKIN: It's beautiful farmland. You're just destroying it on the island.

MS. DELL'OSSO: Where? Ours?

JIM LARKIN: Yeah, beautiful farmland. All that island, where you're putting that in, it's beautiful stuff. It's just a shame what they're doing.

MS. DELL'OSSO: What is not part of this arrangement but something that we are doing is we have an agreement with the Sierra Club, the environmental group, that for every acre we develop here, we are providing them the money to go buy a half acre of farmland elsewhere. That could be here -- you could keep it here, because we are as concerned as you are concerned about property rights. But we don't want to give them up without paying for them, so we're putting our money where our mouth is. We have a half acre that

we're giving to the Sierra Club to buy farm replacement, if you want to call it that.

We're also providing enough money for a half acre of mitigation for endangered species, which isn't necessarily farming, but it could be riparian habitat or something like that.

MR. COLEMAN: Plus, this development is obligated to pay what we call the Habitat Conservation

Plan -- it has a long title -- San Joaquin County Multispecies whatever -- but it's a fee that we impose -- actually the Council of Governments, which is a regional body, imposes on developments prior to grading occurring. We're going to be collecting that fee. That fee has to be paid, then, to this Council of Governments. The Council of Government is obligated then to buy habitat land or agricultural land, easements, that kind of thing.

The City has determined that we are requiring the developers to pay their fair share towards these preservation programs, which is, typically, with regard to settlement with the Sierra Club and other properties that are also affected by other settlements in Lathrop -- we are finding it's a unique situation in Lathrop -- we're requiring, in a lot of cases, the developers are actually coming in with agricultural

mitigation agreements, which I don't think you're seeing in different parts of Stockton or other communities. So we're trying to be mindful of that.

MS. DELL'OSSO: And if you remember, Mr. [INAUDIBLE] who used to own the property -- remember him? He was always a landlord that rented to other people. He lived in Palo Alto. It was just different.

We also have a requirement -- just talking about farming -- that as we develop out the project in the long run it will all be developed; but, as we develop it out, half will be retained for farming the balance of it. So that elongates the farming process.

MR. COLEMAN: What the City tries to do -- and I know this is not a City meeting -- but the City is trying to balance various needs. The area has a high rate of unemployment and has a tremendous commutation going into the East Bay. And what the city council has felt is very important to try is to create higher-wage jobs in our area so that you don't have the need to commute. And we're not going to end the commuting -- but just so you don't have as much of a need to commute in the Bay Area. It would be more family wage jobs in this area. And almost four million square feet of building space has been approved in this project for the development of an employment center, which is very, very

important.

JIM LARKIN: Will there be more roads into this?

MR. COLEMAN: This developer has a lot of obligations. As I said, we do these conditions of approval on these developments. And there are probably 200 conditions on this project. A lot of those conditions and a lot of things that were in the City's environmental impact report require that they mitigate -- that's just a term that's used -- that they provide payments for road improvements.

Developers in Lathrop -- and Lathrop is the only city in this county that does this -- the City of Lathrop has regional transportation impact. And, again, we're the only city in this county that has a full regional transportation impact fee. We're requiring every developer every time they build a house -- I can't remember the exact amount that applies in this project. In another one, I think it's $2,400. Each house is paying into a regional transportation fee that the City maintains. That fee can be used, depending on what the city council wants to do, for any state highway in San Joaquin. Now, will they use it for Highway 12? My guess is not. Will it go toward 205 improvements? I think it could. But 205 can only be fixed by Caltrans.

That's a Caltrans project. But at least we're requiring our developers to pay their fair share towards the regional road improvements. And that's all we can do, legally. It's the maximum we can do. Many developers don't like that, but that's what we're doing.

JIM LARKIN: All it's going to do to 205 is just to stop it.

MR. COLEMAN: Well, this also provides for a bypass around 205.

MS. DELL'OSSO: We have this frontage road that we're building as part of the project that will go all the way out to Mountain House. Also, this four-million-square-foot employment center is going to have about 15- to 17,000 jobs in it; so there will be more jobs here than the people that are employable on our site. So whether all of our people work there -- probably not. But, hopefully, someone from Tracy will come and work there and get off the 205 and not --

MR. COLEMAN: We actually have done a study that shows some reverse commuting, which is very interesting, from -- let's call it the far East Bay -- Livermore, let's say, into an employment center here. We'd like it to be even more localized than that, but it's an interesting possibility that you'd actually get some reverse commuting taking place. This is not going

to happen overnight. It's going to take time for that to happen. But, also, we're requiring -- another thing the City is requiring every house in this development pays $5,000 in economic development fees. Eighty percent of that money must be used to go and incentivize the creation of jobs in this community. The council is very focused on job creation. That is a major objective of the City of Lathrop.

So we're trying to balance all of these needs -- the agricultural needs with the employment needs in a high unemployment area with the needs of roads, with the needs for a variety of housing types. And there's no way to balance all those needs perfectly to make everyone happy. But the objective is to try to meet as many of those objectives as possible.

JIM LARKIN: Is there any bridges going into Roberts Island?

MR. COLEMAN: No.

JIM LARKIN: A long time ago there was. Way, way back there was a plan. They took them out. I remember when I was a kid, there was a bridge that was supposed to go down Paradise Road, but I don't know where it was. The City of Lathrop stopped that years ago.

Then there was flags back there when they

started surveying for this project. They put flags on our levee, on our side.

MR. GEBHARDT: Actually, the Department of Water Resources, with approval from the rec districts, went in and did some high-level cartography, trying to get a better handle on where the water was going in the flows. I know they checked with all the rec districts.

If there was a bridge from anywhere in Lathrop onto your island, it would have to be in the City's general plan to begin with. And I guarantee -- and Bruce can confirm -- because I helped prepare the general plan back then. And there's nothing on the plan that shows anything connecting to Roberts Island. The City made a terrible mistake once and I was part of that, because we were all told it was the perfect thing to involve Roberts Island -- disposing a sewer. That was a terrible mistake. I was led down that garden path by the consultants, who said this is the perfect thing to do. And Roberts Island made it real clear -- mistake.

JIM LARKIN: I was joking with people out there. They made a big mistake when they laid those sewer lines.

MS. DELL'OSSO: One of the things in that law says there can be sewer used in a primary zone. And I

think it was because of what he did.

MS. JOHNSON: Why don't we just focus for a moment. As you said, it is a Corps of Engineers meeting.

And maybe you'd like to know a little bit of why we are involved in at all, because we are. And we have a decision in this whole process. Just to kind of show the other side, this is not a done deal at the moment. We will have to go through our permitting process, which Tom Cavanaugh can tell you a little about. And because Stewart Island has federally built project levees on there, we also have a different authority that we will be looking at. And Jim Sandner can tell you about that so that you have a better idea what this overall -- why we're here, why we're involved in at all. And Jones & Stokes Associates are the environmental consultants on this project. It is a big project and requires a big effort on everybody's part.

But maybe, Tom, you can explain a little bit about the Clean Water Act and our permitting.

MR. CAVANAUGH: I'm Tom Cavanaugh. Right now, I'm acting as the chief of the Central California-Nevada section of the Sacramento District regulatory branch.

But the Corps is going to be looking at this project from three perspectives. And the first one up

there is 33 USC, Section 408 for modification of flood control levees. That's something Jim will tell you more about, because that's not what we do. That's a different section of the Corps. The two laws we work under -- or the two authorities we work under -- are

Section 10 of the Rivers and Harbors Act. That basically requires anybody who is going to do work in or over a navigable waterway to get a permit before they do that. The second authority is Section 404 of the Clean Water Act. That one basically requires anybody who discharges dredged or fill material into the waters of the U.S. -- wetlands -- that they get a permit before they do that. So those are the two things we look at.

Under the 404 process, the decision we've made with this one is that we are going to be doing an environmental impact statement, which is the most extensive of the environmental documents we do. So we started out with a public notice -- and I'm not sure when that necessarily went out. But there was a public notice.

So one of the things we will do is we're going to look at alternatives to the proposed project, because, by regulation, we can only permit what we determine to be the least environmentally damaging practical habitat. So we have to make sure that we

minimize the damage -- the environmental damage -- from the project while still finding an alternative that can be done, whatever that means. So we do that. A couple of processes we go through for the endangered species associated with the project. We'll have to have separate consultations with the Fish and Wildlife Service and National Fishery Service on how it impacts the fish species or the other species the fish and wildlife services looks at. And we -- do we have a SHPO consultation?

MS. JOHNSON: Oh, yeah.

MR. CAVANAUGH: So for cultural resources, for historic property, we consult with the state historical preservation officer who is going to go through that process. So we go through those things. We do alternatives analysis. We also carry out a public interest review. We look at the way it affects traffic and circulation and air quality and water quality and affects agriculture -- a number of things we look at how it affects.

At the end of that process, we make a decision. The decision is based on an alternatives analysis, a public interest review. They need to -- before we can make a decision, we need to get a certification from the California Regional Water Quality

Control Board. And they basically look at the air quality aspects -- the affects of the project and decide whether they are concerned about it.

So at the end of that we make our decision. And that's either a decision to issue a permit or, based on some item, deny the permit. So that's one thing that you can do here tonight and other comments you have either here or during development of the document, can make your position known so we can consider that.

That's all I have.

MS. JOHNSON: Because this is an unusual project and because we have flood control levees involved, that's why we have Jim here to answer that.

MR. SANDNER: My name is Jim Sandner and I'm with the Corps of Engineers as well in the operations and readiness branch. And part of our responsibility in that branch is to inspect and ensure that local flood protection projects are operated and maintained in accordance with the agreements we have signed with our non-federal sponsors.

In this instance, this portion of the San Joaquin River flood control project, our sponsor is the State of California -- the reclamation board. In turn, the reclamation board has made an agreement with the local levee district, 462, to operate and maintain the

levees that currently exist on Stewart Tract. And since federal funding was utilized in some of the repairs that were done on those levees over the years, there's a federal interest there. So our headquarters has made a determination that US Code 33, Section 408, applies to this project. And what that law says is that if you alter a levee that was built or paid for by the federal government you have to get permission from the Secretary of the Army for that alteration.

And there's two things that we need to do in the review process for obtaining that permission. And that is to make a determination that the project is not injurious to the public and that the actual alteration does not injure the usefulness of the flood control structures. So we have those two elements that we have to review and look at in the permitting process for 408.

That process is somewhat complicated because of our agreements with the State of California. They actually own all the lands, easements, and rights of way associated with this flood control project. The federal government does not own anything here. We have an interest because federal monies were expended at one time or another on this project. The State actually has the final say in whether or not they will agree to the alteration of the flood control project.

The Corps of Engineers, in their permitting process, the district engineer will make a recommendation to our headquarters. The Secretary of the Army has delegated down to the chief of engineers -- that is the top general in the Corps of Engineers in Washington, D.C. -- the actual authority to give permission. The State will work with the developer on their application. And the State actually will ask the Corps of Engineers to alter the project if they want to do that, if they decide that it's appropriate.

In our analysis, we will determine whether it's appropriate to allow alteration. We will make a recommendation to the chief of engineers to either give a permit or to deny a permit. We can give permission for the alteration and the State can still deny the project -- the rec board can. We can also deny permission and the State can decide -- actually vote and approve the project. So it's kind of a complicated situation in the way these local protection projects are set up. The State actually has full responsibility for operation and maintenance of this project. All the federal government does is kind of inspect it to ensure that the operations and maintenance manual is being followed.

Several things that you mentioned early on was

that concern about what was going to happen upstream or downstream as it relates to the levees that are going to be built with this project. That was one of the primary things that we are going to be reviewing as to what will happen with the hydraulics and the hydrology of the San Joaquin River and Paradise Cut as it relates to this project. And there's a specific design elevation that was engineered for the San Joaquin River flood control project. And our analysis will be to determine whether that design elevation has affected either negatively or positively our analysis.

And the other thing that we will be looking at is the actual construction of the levees to make sure that they meet the engineering standards. And we will also be looking at where the housing is placed in relationship to the levee works.

JIM LARKIN: The only problem, you can open that big channel up and let a lot of water out. And what's it going to do to the Delta? It is going to raise the rivers? Will it break all the islands?

MR. SANDNER: We have done some preliminary modeling for the actual proposal. And our preliminary works shows that it has little or no impact either upstream or downstream.

JIM LARKIN: I think upstream it would be put less water on them up there, because to let it out faster --

MR. SANDNER: And that is part of the design of this project. The developer has to take into account the affects on Paradise Cut. They actually have levees set back on that side of the island to allow more water to move down through that area and fill that area rather than having an impact either upstream or downstream.

JIM LARKIN: I know it will help us, but you don't know whether it's going to pour more water on them.

MR. SANDNER: The model that we are using to look at these kinds of things is fairly sophisticated. One of the things that our engineers are specifically looking at is what kind of data was placed in the model. And we are reviewing that to make sure that the appropriate data was entered into the model so they can actually --

JIM LARKIN: All of the water coming down --

MR. SANDNER: All of that is considered in the model. Again, the Sacramento River flood control project, as it was built initially, dealt with primarily farmland. Many of the levees that are in this southern portion of the flood control system were only protecting agricultural land. And the level of flood protection

was less than a hundred-year level. And there was an understanding that if you had a storm that was going to be more than a 40-year event, you would have flooding in these agricultural areas. Again, there wasn't a significant concern for that because it wasn't going to destroy property and it wasn't going to have an impact on human lives in most cases.

JIM LARKIN: Well, I hope you guys are right is all I hope.

MR. SANDNER: I would hope that our analysis would be accurate and that our determination would ensure that there's not going to be a significant impact.

JIM LARKIN: Nature can do some weird things.

MR. SANDNER: I don't disagree with that.

MS. JOHNSON: Maybe it would just help a little bit -- Anna is from Jones & Stokes comments on the impact if you understood a little brief overview of the process so you would know when there will be further opportunities for you and other landowners that we did not reach for some reason to be involved in this all the way down, because there will be such opportunities. Anna is better at explaining this chart than I am.

MS. BUISING: I want to introduce the other two members of our team from Jones & Stokes who are here

tonight so you know who everybody in the room is. Alan Solbert down at the end will be helping out with the development of the alternatives. And Steve Centerwall is the project director, which basically means that his job is to make sure that I and the rest of the EIS team do our job right and present the Corps with a good document and hopefully an analysis that will support good decision making.

So I just want to talk really quickly -- and I know you've watched projects come through, be proposed, be approved, be denied. You're probably really familiar with how the environmental review process proceeds under NEPA. But I want to talk about that framework and how it relates to the Corps' review process and where we are now and where we are going from here and what specifically the opportunities are for you and all your neighbors to engage in the discussion, because one of the really important pieces of the National Environmental Policy Act is the requirement that federal agencies, when they make a decision, propose a project, permit a project like this case, or fund a project -- put an analysis out there for public review that addresses what are the environmental effects and also looks for resolutions to any adverse effects that may be identified as well as putting out there what the

benefits may be. And that's one piece.

The other really key piece of the legislation is that at key steps throughout the process, federal agencies are directed to go out and engage the public and engage other agencies that may not be directly involved but may have input to share on what the issues are and what the concerns are.

So that's actually the first point we are at in this diagram. We've highlighted all the opportunities for public involvement in orange so that they will really jump out at you. Obviously the Corps is the lead agency because of the need for permitting under the federal Clean Water Act. They have been through the process that establishes, yes, this is a project that merits preparation of an environmental impact statement, which means they're going for full environmental review. They have published the notice of intent that makes it formal, makes it official, and says, yes, we are going for the EIS process.

And we are now at the scoping phase. And the purpose of scoping under NEPA is explicitly -- very clearly -- identified as this is the point where the agency must go out and collect input from the public. So our purpose really in being here tonight -- I'm really glad you stuck it out in the 40 minutes of

wandering in the wilderness -- our purpose in being here tonight is to hear what your concerns are and to hear what you feel needs to be addressed in the document. If you've been watching Alan and Steve absorbing everything that you're saying, we hope -- my job is now to go and make sure that the EIS team gets that in the document and gets it in there early. Then you'll have an opportunity to see how well we did with that process.

We will go away from the scoping process. And our next task is to go through the process of developing alternatives, because one of the directives is that to really support good and informed decision making, federal agencies can't just look at one version of the project. They have to look at a range of alternatives that would achieve the same purpose. They have to look at the environmental effects not only of the proposed project but also of the potential alternative solutions so that the effects can be compared. And so when the ultimate final permit decision is made it's made on that basis of comparison; and those alternatives can be weighed.

So our next task is to develop a range of alternatives, working with the Corps and the proponent, all based on any input that you folks and the other agencies have to share. The hope is that that will be

finished by the end of 2005.

The Corps wants to hold another meeting when we get a little farther along in the process to solicit more input to share what the process has yielded so far and get additional input from you and all your neighbors and from the other agencies with an interest in the project. That will possibly happen towards the end of this year. So if we have your address on the mailing list, you'll be notified when that happens.

Then the next phase: Once we have that range of alternatives to look at identified, our job is to go away and think about your concerns that you're bringing to the table. What are the environmental effects? You mentioned traffic. That's obviously something we need to look at. Air quality issues. Effects on agriculture. Hydrology, flood protection -- the piece that is specifically related to the Corps' analysis.

Also, all the broader pieces -- the quality of life, the quality of the human environment. So that's the next step.

The Corps' goal is to have a draft EIS ready to circulate for public review by November 2006. At that point the document will be filed with the U.S. Environmental Protection Agency. They are effectively stewards of the NEPA process and they perform a quality

review to make sure the document is adequate and that we have done our job by NEPA, that the Corps has done their job by NEPA. At the same time the document is released to the public for review. And you'll be noticed. We will send out notices. We will let you know that's happening. And all of the comments that the public and other agencies put out there on the draft document -- the Corps is then required to take those back, to consider them, to evaluate them, to respond to them in writing. So all of the body of comments and all of the body of response that the Corps develops will then go into the final Environmental Impact Statement.

We are now at this third orange step -- actually, I skipped one. I ought to mention that there will be a third public meeting. Once everyone has had a chance to review the document, the Corps will hold a public hearing and will solicit -- hey, come talk about it. Tell us. Bring anything else that you didn't already get on the table. All of that comment from the public meeting, the written comments, comments that come in by e-mail, phone calls -- everything that Patti and her team receives we will distill into the final environmental impact statement. And that will go out for review. It's filed with the EPA again, because the EPA has that repository responsibility, and does a

quality assurance review to make sure that the document is adequate, that it does its job of analysis.

And then that final EIS will be circulated for another round of review and comment. And the Corps is also required to take all those comments that you may have on the final EIS and respond to those comments and consider that in making their permit decision.

So there's multiple tiers of review where the Corps is legally obligated to go out and actively seek public input and then to take that seriously, to take it under consideration. So all of that we'll distill down; the Corps will make a decision whether or not to adopt the final impact statement as, yes, we believe this is a fair and appropriate analysis of the project and the alternatives to the original project proposal and the environmental effect of all those approaches to meeting the same purpose and need. They will make decisions on the permit applications for the project. And then they're required to file a final record of decision with the EPA that says here's the decision we came to and here's why.

So that's a quick overview. Questions? Comments? Thoughts for us?

JIM LARKIN: When they put this Paradise thing in, they're still going to have the overflow system out there, right? They're not going to open it to the San Joaquin River? Because right now it's an overflow system.

[CROSS TALK]

JIM LARKIN: But then the people are going to want water down that nice place to play and stuff.

MS. DELL'OSSO: That's ground water. It's ground water.

JIM LARKIN: Do they pump water in there?

MS. DELL'OSSO: No, it's ground water.

JIM LARKIN: Oh, ground water from the level.

MS. DELL'OSSO: Exactly.

MS. BUISING: We really appreciate you coming.

[THE MEETING CONCLUDED AT 8:14 P.M.]

STATE OF CALIFORNIA)
COUNTY OF SAN FRANCISCO)

CERTIFICATE OF REPORTER

I, the undersigned, a duly authorized Shorthand Reporter and licensed Notary Public, do hereby certify that the within proceedings were taken down by me in stenotype and thereafter transcribed into typewriting under my direction and supervision and that this transcript is a true record of the said proceedings.

____

FREDDIE REPPOND

Appendix A-4

Public Scoping Comments

CALIFORNIA CONSERVATION

DEPARTMENT OF CONSERVATION

DIVISION OF LAND RESOURCE PROTECTION

801 K STREET • MS 18-01 • SACRAMENTO, CALIFORNIA 95814

PHONE 916 / 324-0850 • FAX 916 / 327-3430 • TDD 916 / 324-2555 • WEB SITE conservation.ca.gov

June 22, 2005

Patti Johnson, Project Manager
U.S. Army Corps of Engineers
Sacramento District
1325 J Street, Room 1480
Sacramento, CA 95814-2922

The U.S. Army Corps of Engineers is preparing a draft Environmental Impact Statement for the River Islands project in San Joaquin County. This project involves a large scale, mixed use development. The Notice indicates that open-space and recreational amenities may be included as part of the project. Major changes in the operation and maintenance of a Federal flood control project, navigation, hydrology, water quality, wetlands, endangered species, agricultural resources, transportation, cultural resources, and air quality will be discussed in the draft environmental document.

The Department of Conservation's (Department) Division of Land Resource Protection (Division) monitors farmland conversion on a statewide basis and administers the California Land Conservation (Williamson) Act, California Farmland Conservancy Program, and other agricultural land conservation programs. We ask that our comments be incorporated into the draft document, and that we receive a copy of the EIS for our review and comment.

Our comments follow:

The DEIS should provide a detailed discussion pertaining how implementation of any component of the proposed project may impact agricultural resources, especially since this project involves conversion of acreage from agriculture to another use. Much of the land in the project area and in surrounding areas is in agricultural use, and some of this is under Williamson Act contract. The document should clearly indicate whether the acreage that would be converted or impacted is under Williamson Act contract. Requirements for contract cancellation are in the statute under Article 5, and copies of the Act are available from this office for your perusal.

We strongly recommend that the federal Land Evaluation and Site Assessment (LESA) model be utilized to determine the level of significance that the proposed project would have on agricultural resources The Department's LESA model can also be used. The California LESA model can be found on our website: www.consrv.dlrp.ca.gov. We would be pleased to provide assistance, meet with you, and answer any questions.

There is a potential significant impact to agricultural resources associated with implementation of the proposed project. We ask that mitigation measures be clearly identified in the EIS and a schedule for implementation be included, with responsible parties, departments or agencies responsible form implementation be identified as well.

Thank you for the opportunity to review this Notice of Intent. If you have any questions regarding these comments please contact Jeannie Blakeslee at (916) 323-4943. Again, we would be pleased to meet you and provide assistance.

Sincerely,

Dennis J.O'Bryant
Acting Assistant Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

IN REPLY REFER TO
ER 05/514

JUL 20 2005

Ms. Patti Johnson
U.S. Army Corps of Engineers
1325 J Street, Room 1480
Sacramento, California 95814-2922

Dear Ms. Johnson:

Thank you for the opportunity to review the Notice of Intent to prepare an Environmental Impact Statement for the proposed River Islands Project located within the Sacramento-San Joaquin River Delta (Delta). The enclosures are intended to assist you in your continued environmental review of this proposal. Because the proposed action would implement the reconstruction and strengthening of levees, excavation of Paradise Cut, dredge and fill of jurisdictional wetlands and waters of the United States, construction of recreational facilities including marinas, and the development of a mixed use community to include about 11,000 new homes, future consultation with the U.S. Fish and Wildlife Service (Service) may be required under the Fish and Wildlife Coordination Act and the Endangered Species Act.

Enclosure A provides a list of sensitive species that may occur in or near the project site. The Service's sensitive species database is constantly updated as species are proposed, listed and delisted. If you address proposed, candidate and special concern species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. You can get this list directly by accessing our web site at: www.fws.gov/pacific/sacramento/es/spp_lists. The Service recommends that surveys for sensitive species be completed by a qualified biologist on the proposed project site to confirm the presence or absence of special-status species or their habitats.

Enclosure B recommends general guidelines for identifying and mitigating project impacts to fish, wildlife, and their habitats. The Council on Environmental Quality developed regulations for implementing the National Environmental Policy Act, and defines mitigation to include: (1) avoiding the impact; (2) minimizing the impact; (3) rectifying the impact; (4) reducing or eliminating the impact over time; and (5) compensating for impacts. The Service supports and adopts this definition of mitigation and considers the specific elements to represent the desirable sequence of steps in the mitigation planning process. Accordingly, we maintain the best way to mitigate adverse biological impacts is avoidance when at all possible.

We encourage you to use these guidelines to develop a comprehensive environmental document that addresses these needs. If you have any questions regarding these comments, please contact Mark Littlefield (Watershed Planning Branch) in the Sacramento Fish and Wildlife Office, at (916) 414-6520.

Sincerely,

Doug Weinrich

for David L. Harlow
Acting Field Supervisor

Enclosures

cc:
Loretta Sutton, OEPC, Washington, D.C.
CNO, Sacramento, CA
Regional Manager, CDFG, Region 2, Rancho Cordova, CA (w/o enclosures)

ENCLOSURE A

Federal Endangered and Threatened Species that Occur in or may be Affected by the River Islands Project in San Joaquin County, California

Document Number: 050713083938

List Prepared July 13, 2005

Database Last Updated: June 20, 2005

County Lists

San Joaquin County

LISTED SPECIES

Invertebrates
Branchinecta conservatio - Conservancy fairy shrimp (E)
Bran*chinecta longiantenna* - longhorn fairy shrimp (E)
Branchinecta lynchi - Critical habitat, vernal pool fairy shrimp (X)
Branchinecta lynchi - vernal pool fairy shrimp (T)
Desmocerus californicus dimorphus - valley elderberry longhorn beetle (T)
Lepidurus packardi - vernal pool tadpole shrimp (E)

Fish
Hypomesus transpacificus - Critical habitat, delta smelt (X)
Hypomesus transpacificus - delta smelt (T)
Oncorhynchus mykiss - Central Valley steelhead (T)
Oncorhynchus tshawytscha - Critical habitat, winter-run chinook salmon (X)
Oncorhynchus tshawytscha - winter-run chinook salmon, Sacramento River (E)

Amphibians
Ambystoma californiense - California tiger salamander (T)
Rana aurora draytonii - California red-legged frog (T)

Reptiles
Ma*sticophis lateralis euryxanthus* - Alameda whipsnake (T)
Thamnophis gigas - giant garter snake (T)

Birds
Haliaeetus leucocephalus - bald eagle (T)

Mammals
Neotoma fuscipes riparia - riparian (San Joaquin Valley) woodrat (E)
Sylvi*lagus bachmani riparius* - riparian brush rabbit (E)
Vulpes macrotis mutica - San Joaquin kit fox (E)

Plants
Amsinckia grandiflora - Critical habitat, large-flowered fiddleneck (X)
Amsinckia grandiflora - large-flowered fiddleneck (E)
Castilleja campestris ssp. *succulenta* - Critical habitat, succulent (=fleshy) owl's-clover (X)
Castilleja campestris ssp. *succulenta* - succulent (=fleshy) owl's-clover (T)

PROPOSED SPECIES

Fish
Acipenser medirostris - green sturgeon (P)
Oncorhynchus mykiss - Critical habitat, Central Valley steelhead (Proposed) (PX)

Amphibians
Ambystoma californiense - Critical habitat, CA tiger salamander (Proposed) (PX)
Rana aurora draytonii - Critical habitat, California red-legged frog (Proposed) (PX)

CANDIDATE SPECIES

Fish
Oncorhynchus tshawytscha - Central Valley fall/late fall-run chinook salmon ©
Oncorhynchus tshawytscha - Critical habitat, Central Valley fall/late fall-run chinook ©

SPECIES OF CONCERN

Invertebrates
Anthicus antiochensis - Antioch Dunes anthicid beetle (SC)
Anthicus sacramento - Sacramento anthicid beetle (SC)
Branchinecta mesovallensis - Midvalley fairy shrimp (SC)
Hygrotus curvipes - curved-foot hygrotus diving beetle (SC)
Linderiella occidentalis - California linderiella fairy shrimp (SC)
Lytta moesta - moestan blister beetle (SC)
Lytta molesta - molestan blister beetle (SC)

Fish
Lampetra ayresi - river lamprey (SC)
Lampetra hubbsi - Kern brook lamprey (SC)
Lampetra tridentata - Pacific lamprey (SC)

Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfin smelt (SC)

Amphibians
Rana boylii - foothill yellow-legged frog (SC)
*Spea hammondii (*was *Scaphiopus h.)* - western spadefoot toad (SC)

Reptiles
Anniella pulchra pulchra - silvery legless lizard (SC)
Clemmys marmorata marmorata - northwestern pond turtle (SC)
Clemmys marmorata pallida - southwestern pond turtle (SC)
Masticophis flagellum ruddocki - San Joaquin coachwhip (=whipsnake) (SC)
Phrynosoma coronatum frontale - California horned lizard (SC)

Birds
Agelaius tricolor - tricolored blackbird (SC)
Amphispiza belli belli - Bell's sage sparrow (SC)
Athene cunicularia hypugaea - western burrowing owl (SC)
Baeolophus inornatus - oak titmouse (SLC)
Botaurus lentiginosus - American bittern (SC)
Branta canadensis leucopareia - Aleutian Canada goose (D)
Buteo regalis - ferruginous hawk (SC)
Buteo Swainsoni - Swainson's hawk (CA)
Carduelis lawrencei - Lawrence's goldfinch (SC)
Charadrius montanus - mountain plover (SC)
Contopus cooperi - olive-sided flycatcher (SC)
Elanus leucurus - white-tailed (=black shouldered) kite (SC)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Grus canadensis tabida - greater sandhill crane (CA)
Lanius ludovicianus - loggerhead shrike (SC)
Laterallus jamaicensis coturniculus - black rail (CA)
Limosa fedoa - marbled godwit (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long-billed curlew (SC)
Picoides nuttallii - Nuttall's woodpecker (SLC)
Plegadis chihi - white-faced ibis (SC)
Riparia riparia - bank swallow (CA)
Selasphorus rufus - rufous hummingbird (SC)
Sphyrapicus ruber - red-breasted sapsucker (SC)
Toxostoma redivivum - California thrasher (SC)

Mammals
Corynorhinus (=Plecotus) townsendii townsendii - Pacific western big-eared bat (SC)
Dipodomys heermanni dixoni - Merced kangaroo rat (SC)
Eumops perotis californicus - greater western mastiff-bat (SC)

Myotis ciliolabrum - small-footed myotis bat (SC)
Myotis evotis - long-eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long-legged myotis bat (SC)
Myotis yumanensis - Yuma myotis bat (SC)
Perognathus inornatus - San Joaquin pocket mouse (SC)

Plants
Aster lentus - Suisun Marsh aster (SC)
Caulanthus coulteri var *lemmonii* - Lemmon's jewelflower (SLC)
Cirsium crassicaule - slough thistle (SC)
Cryptantha hooveri - Hoover's cryptantha (SLC)
Delphinium californicum ssp. *interius* - interior California (Hospital Canyon) larkspur (SC)
Gratiola heterosepala - Boggs Lake hedge-hyssop (CA)
L*athyrus jepsonii* var. *jepsonii* - delta tule-pea (SC)
L*ilaeopsis masonii* - Mason's lilaeopsis (SC)
Sagittaria sanfordii - valley sagittaria (=Sanford's arrowhead) (SC)

Key:

- (E) Endangered - Listed (in the Federal Register) as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed (in the Federal Register) for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Marine Fisheries Service. Consult with them directly about these species.
    - Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- © Candidate - Candidate to become a proposed species.
- (CA) Listed by the State of California but not by the Fish & Wildlife Service.
- (D) Delisted - Species will be monitored for 5 years.
- (SC) Species of Concern/(SLC) Species of Local Concern - Other species of concern to the Sacramento Fish & Wildlife Office.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regard-less of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the quad or quads covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the nine surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

State-Listed Species

If a species has been listed as threatened or endangered by the State of California, but not by us nor by the National Marine Fisheries Service, it will appear on your list as a Species of Concern. However you should contact the California Department of Fish and Game Wildlife and Habitat Data Analysis Branch for official information about these species.

YOUR RESPONSIBILITIES UNDER THE ENDANGERED SPECIES ACT

All plants and animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compen-sates for project-related loss of habitat. You should include the plan in any environmental documents you file.

CRITICAL HABITAT

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our critical habitat page for maps.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

SPECIES OF CONCERN

Your list may contain a section called Species of Concern. This is an informal term that refers to those species that the Sacramento Fish and Wildlife Office believes might be in need of concentrated conservation actions. Such conservation actions vary depending on the health of the populations and degree and types of threats. At one extreme, there may only need to be periodic monitoring of populations and threats to the species and its habitat. At the other extreme, a species may need to be listed as a Federal threatened or endangered species. Species of concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species.

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed, candidate and special concern species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be October 11, 2005.

ENCLOSURE B

The goal of the U.S. Fish and Wildlife Service is to conserve, protect and enhance fish, wildlife, and their habitats by timely and effective provision of fish and wildlife information and recommendations. To assist us in accomplishing this goal, we would like to see the items described below addressed in your environmental documents for the proposed project.

Project Description
The document should very clearly state the purposes of, and document the needs for, the proposed project so that the capabilities of the various alternatives to meet the purposes and needs can be readily determined.

A thorough description of all permanent and temporary facilities to be constructed and work to be done as a part of the project should be included. The document should identify any new access roads, equipment staging areas, and gravel processing facilities which are needed. Figures accurately depicting proposed project features in relation to natural features (such as streams, wetlands, riparian areas, and other habitat types) in the project area should be included.

Affected Environment
The document should show the location of, and describe, all vegetative cover types in the areas potentially affected by all project alternatives and associated activities. Tables with acreage of each cover type with and without the project for each alternative would also be appropriate. We recommend that all wetlands in the project area be delineated and described according to the classification system found in the Service's Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). The Service's National Wetland Inventory maps would be one starting point for this effort, but updated information may be needed.

The document should present and analyze a full range of alternatives to the proposed project. In an effort to fully comply with the Clean Water Act and meet the Federal government's goal of no net loss of wetlands, at least one alternative should be designed to avoid all impacts to wetlands, including riparian areas. Similarly, within each alternative, measures to minimize or avoid impacts to all habitats (wetlands, riparian areas, grasslands, oak woodlands, etc.) should be included.

Lists of fish and wildlife species expected to occur in the project area should be in the document. The lists should also indicate for each species whether it is a resident or migrant, and the time of year it would be expected in the project area.

Environmental Consequences
The sections on impacts to fish and wildlife should discuss impacts from vegetation removal (both permanent and temporary), filling or degradation of wetlands, interruption of wildlife migration corridors, and disturbance from trucks and other machinery during construction and/or operation. These sections should also analyze possible impacts to streams from construction of outfall structures, pipeline crossings, and filling. Impacts on water quality, including nutrient

loading, sedimentation, toxins, biological oxygen demand, and temperature in receiving waters should also be discussed in detail along with the resultant effects on fish and aquatic invertebrates. Discussion of indirect impacts to fish, wildlife, and their habitats, including impacts from growth induced by the proposed project, should also be addressed in the document. The impacts of each alternative should be discussed in sufficient detail to allow comparison between the alternatives.

The cumulative impacts of the project, when viewed in conjunction with other past, existing, and foreseeable projects, needs to be addressed. Cumulative impacts to fish, wildlife and habitats, including water quality, should be included.

Mitigation Planning
Under provisions of the Fish and Wildlife Coordination Act, the Service advises and provides recommendations to Federal agencies planning water development activities or permitting such activities. These Federal agencies are to consult with the Service and give equal consideration to the conservation and rehabilitation of fish and wildlife resources with other project purposes. When reviewing proposed activities, the Service generally does not object to projects meeting the following criteria:

1. They are ecologically sound;

2. The least environmentally damaging reasonable alternative is selected;

3. Every reasonable effort is made to avoid or minimize damage or loss of fish and wildlife resources and uses;

4. All important recommended means and measures have been adopted, with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal; and

5. For wetlands and shallow water habitats, the proposed activity is clearly water dependent and there is a demonstrated public need.

The Service may recommend the "no project" alternative for those projects which do not meet all of the above criteria, and where there is likely to be a loss of fish and wildlife resources.

When projects impacting fish and wildlife resources are deemed acceptable to the Service, we recommend full mitigation for any impacts to fish and wildlife habitat. The Council on Environmental Quality regulations for implementing the National Environmental Policy Act define mitigation to include: 1) avoiding the impact; 2) minimizing the impact; 3) rectifying the impact; 4) reducing or eliminating the impact over time; and 5) compensating for impacts. The Service supports and adopts this definition of mitigation and considers the specific elements to represent the desirable sequence of steps in the mitigation planning process. Accordingly, we maintain that the best way to mitigate for adverse biological impacts is to avoid them altogether.

Project documentation should include a mitigation plan that describes all measures proposed to avoid, minimize, or compensate for impacts to fish and wildlife and their habitats. The measures should be presented in as much detail as possible to allow evaluation of their probable effectiveness.

To determine mitigation credits available for unavoidable impacts, future conditions on the mitigation site, absent any mitigation, are estimated and then compared to conditions expected to develop as a result of implementing the mitigation plan.

Mitigation habitat should be equal to or exceed the quality of the habitat to be affected by the project. Baseline information would need to be gathered at the impact site to be able to quantify this goal, such as plant species diversity, shrub and tree canopy cover, number of stems per acre, tree height, etc. Judging the ultimate success of the project should include success of mitigation, which should use these same measurements at the mitigation site as standards of comparison. Mitigation success criteria should aim toward equaling or exceeding the quality of the highest quality habitat to be affected. In other words, the mitigation effort would be deemed a success in relation to this goal if the mitigation site met or exceeded target habitat measurements (plant cover, density, species diversity, etc.).

Criteria should be developed for assessing the progress of mitigative measures during their developmental stages as well. Assessment criteria should include rates of plant growth, plant health, and evidence of natural reproduction.

The plan should present the proposed ground elevations at the mitigation site, along with elevations in the adjacent areas. A comparison of the soils of the proposed mitigation and adjacent areas should also be included in the plan, and a determination made as to the suitability of the soils to support habitats consistent with the mitigation goals.

Because of their very high value to migratory birds, and ever-increasing scarcity in California, our mitigation goal for wetlands (including riparian and riverine wetlands) is no net loss of in-kind habitat value or acreage, whichever is greater. As a result of their high value and reliance on suitable hydrological conditions, wetlands require development of additional information on the predicted hydrology of the mitigation site. The plan should describe the depth of the water table, and the frequency, duration, areal extent, and depth of flooding which would occur on the site. The hydrologic information should include an analysis of extreme conditions (drought, flooding) as well as typical conditions.

A mitigation plan must include a timeframe for implementing the mitigation in relation to the proposed project. We recommend that mitigation be initiated prior to the onset of construction. If there will be a substantial time lag between project construction and completion of the mitigation, a net loss of habitat values would result, and more mitigation would be required to offset this loss.

Generally, monitoring of the mitigation site should occur annually for at least the first five years, biennially for years 6 through 11, and every five years thereafter until the mitigation has met all success criteria. Remedial efforts and additional monitoring should occur if success criteria are not met during the first five years. Some projects will require monitoring throughout the life of the project. Reports should be prepared after each monitoring session.

The plan should require the preparation of "as-built" plans. Such plans provide valuable information, especially if the mitigation effort fails. Similarly, a "time-zero" report should be mandated. This report would describe exactly what was done during the construction of the mitigation project, what problems were encountered, and what corrections or modifications to the plans were undertaken.

The plan should detail how the site is to be maintained during the mitigation establishment period, and how long the establishment period will be. It will also be important to note what entity will perform the maintenance activities, and what entity will ultimately own and manage the site. In addition, a mechanism to fund the maintenance and management of the site should be established and identified. A permanent easement should be placed on the property used for the mitigation that would preclude incompatible activities on the site in perpetuity.

Finally, in some cases, a performance bond may be required as part of the mitigation plan. The amount of the bond should be sufficient to cover the costs of designing and implementing an adequate mitigation plan (and purchasing land if needed) should the proposed plan not succeed.

Reference:

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Washington, D.C. 103 pp.

STATE OF CALIFORNIA—THE RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, *Governor*

DELTA PROTECTION COMMISSION
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AUG - 2 2005

July 29, 2005

U.S. Army Corps of Engineers
1325 J Street, Room 1480
Sacramento, CA 95814

Attention: Patti Johnson

Subject: River Islands, City of Lathrop, San Joaquin County, Notice of Intent (NOI) to Prepare a Draft Environmental Impact Statement (DEIS)

Dear Ms Johnson:

I am writing regarding the above-named NOI published in the Federal Register on June 10, 2005. The NOI will address "impacts such as major changes in the operation and maintenance of a federal flood control project, navigation, hydrology, water quality, wetlands, endangered species, agricultural resources, transportation, cultural resources and air quality." The Commission itself has not reviewed the NOI so these are staff comments only. They are, however, based on the Delta Protection Act of 1992 (Act) and the Commission's adopted Land Use and Resource Management Plan for the Primary Zone of the Delta (Plan).

The Commission has directed staff to comment on projects in a zone of concern, which includes areas directly adjacent to and within about 1,000 feet of the Primary Zone of the Delta. In addition, the Commission has directed staff to comment on projects in the Secondary Zone that may impact the resources of the Primary Zone. The proposed project is located on Stewart Tract, an island located in the Secondary Zone and directly adjacent to the waterways and lands of the Primary Zone to the north including Lower Roberts Island and Union Island.

Project Site Description:

The proposed project includes several different elements all located on Stewart Tract, RD 2062, lying east of San Joaquin River, north of Paradise Cut and south of Old River. The entire Stewart Tract covers 3,910 acres and is protected from inundation by 12.3 miles of project levees. The project site is located north of the railroad tracks and north of Interstate 205. These lands are currently in agricultural use.

Proposed Project Description:

The proposed project includes:

- 305 acre employment center;
- 45 acre town center;
- single and multi-boat docks;
- 2,060 acres of residential development;
- 2 golf courses;
- 260 acres of park land;
- 600 acres of lakes, waterways and canals;
- 600 acres of open space; and
- public facilities and infrastructure.

Comments Based on the Recommendations in the Commission's Land Use Plan:

Land Use:
The Plan recommends that "to the extent possible, any development in the Secondary Zone should include an appropriate buffer zone to prevent impacts of such development on the lands in the Primary Zone. Local governments should consider needs of agriculture in determining such a buffer".

Comment: The DEIS should describe agriculture in nearby areas of the Primary Zone and its needs. The DEIS should evaluate an appropriate buffer zone to be included at the proposed project site (not on adjacent properties) to prevent impacts of the proposed development on the lands and resources in the Primary Zone.

Water:
The Plan recommends that water agencies work together to ensure that adequate Delta water quality standards are set and met and that beneficial uses of the State waters are protected.

Comment: The DEIS should describe in detail potential discharges from the proposed project and associated activities, and should describe mitigation measures that will protect the water quality of nearby Primary Zone waterways.

Recreation and Access:
The Commission's plan recommends that the carrying capacity of the Delta waterways be studied to ensure that recreation activities not degrade habitat values.

Comment: The DEIS should evaluate the carrying capacity of the Delta waterways surrounding the project location and how any proposed boat docks and vessel traffic might impact habitat values of the waterways.

The Plan recommends that new projects in the Secondary Zone, adjacent to the Primary Zone, include commercial and public recreation facilities that allow safe, supervised access to and along the Delta waterways (pedestrian and bike trails, launch ramps including small boat launch ramps, windsurfing access, overlooks, nature observation areas, interpretive information, picnic areas, etc.).

Comment: The DEIS should identify appropriate public recreation facilities that take advantage of the unique Delta location of the proposed project. In addition to the bike/pedestrian trails, the proposed project could include small boat launch facilities (canoes, kayaks), overlooks, nature observation areas, interpretive areas, benches, picnic tables and other facilities.

The Commission's Plan supports development of funding sources to provide enforcement of laws to protect the health, safety and welfare of Delta recreational users.

Comment: The DEIR should identify funding sources that will be needed to supervise new recreation facilities.

Levees:
The Commission's Plan supports levee maintenance, rehabilitation, and upgrading of Delta levees for increased levee stability. For the Delta region, the CALFED program recommends bringing all levees to the PL84-99 standard.

New residential development in other areas in the City of Lathrop, east of the San Joaquin River, include a setback of 200 feet or more that is used for open space/park activities, as well as for access for levee inspection and maintenance.

Comment: The DEIR should describe how the proposed very wide levee with buildings and landscaping on the levee will meet federal flood control requirements for maintenance and inspection of the levee. The DEIS should evaluate the need for open areas between the levee toe and residential or other structures to allow for inspection of the levees and possible future levee maintenance.

Thank you for the opportunity to review the NOP. Please feel free to call if you have questions about these comments, or the Commission's Plan.

Sincerely,

Margit Aramburu
Executive Director

Cc: Chairman Mike McGowan
Commissioner John Beckman
Susan Dell Osso, River Islands
Bruce Coleman, City of Lathrop

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

August 1, 2005

Colonel Ronald N. Light
District Engineer
U.S. Army Corps of Engineers
Sacramento District
1325 J Street, 14th floor
Sacramento, California 95814-2922

Subject: Notice of Intent (NOI) to Prepare a Draft Environmental Impact Statement (DEIS) for the River Islands at Lathrop, Lathrop, CA

Dear Colonel Light:

The Environmental Protection Agency (EPA) has reviewed the Notice referenced above. Our review is pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act. As noted in our detailed scoping comments (enclosed), we are concerned with the proposed project's compliance with the Federal Guidelines promulgated under CWA§404(b)(1) in terms of avoidance, minimization, and mitigation of potential impacts to aquatic resources (40 CFR 230.10).

On May 7 and 28, 2004, we provided written comments on the proposed project. Pursuant to the 1992 Memorandum of Agreement (MOA) between EPA and the Department of the Army prepared under Section 404(q) of the Clean Water Act (CWA), we determined the proposed project will result in substantial and unacceptable impacts to aquatic resources of national importance (ARNIs). We have identified the proposed project as a candidate for elevation in which EPA reserves the option to request a higher-level review of any permitting decisions made by the Sacramento Corps District. In our comments, we urged the Corps to require the preparation of an EIS under NEPA.

We appreciate the opportunity to review this NOI and agree with the purpose and need established by the Corps on April 4, 2005. We are also encouraged by the decision to complete an EIS in order to analyze the significant impacts that may result from the proposed project. EPA is available to provide additional input and guidance to the Corps and the project sponsor on this important project.

We look forward to continuing to work with you. When the DEIS is released for public review, please send (3) copies to the address above (mailcode: CMD-2). If you have any questions, please contact me or Summer Allen, the lead reviewer for this project. Summer can be reached at 415-972-3847.

Sincerely,

Nova Blazej, Acting Manager
Federal Activities Office

Enclosure: Detailed Comments

cc: Patrick Wright, Director California Bay-Delta Authority
Margit Aramburu, Executive Director Delta Protection Commission
U.S. Fish and Wildlife Service, Stockton Office
California Department of Fish and Game, Sacramento Office
Patricia Leary, Central Valley Regional Water Quality Control Board
Paul A. Marshall, California Department of Water Resources

EPA DETAILED COMMENTS ON THE NOTICE OF INTENT TO PREPARE A DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR RIVER ISLANDS AT LATHROP, AUGUST 1, 2005

Water Resources

Clean Water Act, Section 404

The 5,546-acre project area proposed for the River Islands at Lathrop contains approximately 380 acres of jurisdictional waters, as verified by the Army Corps of Engineers through previous coordination associated with the Clean Water Act (CWA) Section 404 application process. This process estimated that the project would cause a direct loss of 31.60 acres of waters, including wetlands, as well as additional indirect impacts to an unquantified number of acres of aquatic resources in the surveyed area. This project will require an individual permit from the Corps.

Recommendations:

The DEIS should demonstrate consistency with the CWA Section 404(b)(1) Guidelines, in that the range of alternatives must include the Least Environmentally Damaging Practicable Alternative (LEDPA). "Practicable" alternatives are alternatives that are available and capable of being done. Only the LEDPA can be permitted.

The DEIS should clearly document the impacts to aquatic resources associated with the project alternatives and identify the methodology used to distinguish between permanent and temporary impacts from each element of the project design. Impacts to aquatic resources associated with each of these project design elements should be clearly presented in the DEIS.

Any mitigation proposed for impacts to waters of the United States should be consistent with the avoidance and minimization sequencing established by the U.S. Army Corps of Engineers. Once impacts to waters are avoided and minimized to the extent practicable, compensatory mitigation can be used. The DEIS should clearly identify suitable mitigation areas, both within the project site and in the project vicinity. Suitable mitigation areas are areas that will not be disturbed by power boat traffic, or subject to frequent disturbances such as maintenance dredging. The DEIS should identify the legal mechanism, such as a conservation easement with a third party, that will be used to protect the mitigation area into perpetuity. The DEIS should also establish long-term management measures for the mitigation areas to address issues such as invasive species, approved uses, and human disturbances (garbage, trampling, etc.).

Water Quality

Discharges of treated wastewater into the San Joaquin River could lead to significant and unavoidable adverse impacts on surface water quality and fisheries. In addition, the proposed marinas may alter water flows and negatively affect biochemical oxygen demand and dissolved oxygen levels, and may result in the loading of petrochemicals into this portion of the South Delta. Salmon enter and leave the San Joaquin River in this location and would encounter a "chemical blockade" that would disrupt their migration. Other short- and long-term threats to water quality include construction-related erosion and increased turbidity that would occur during the 20-year build-out period for the proposed project, as well as pollutant discharges associated with the perpetual operation and maintenance of suburban infrastructure.

EPA also has concerns with the proposed man-made lake system. The lake system is designed to detain stormwater, and although Best Management Practices (BMPs) have been proposed for stormwater discharges, it appears the BMPs alone will not adequately address all the adverse effects of increased stormwater flows. The lake system may not be able to sufficiently sequester pollutants generated by the proposed development and may discharge pollutants into the Delta receiving waters. In addition, the anticipated lack of circulation in the lake system might encourage the growth of non-native, invasive, and harmful plant species such as Egeria and water hyacinth. Water hyacinth and Egeria displace native plant species, reduce food-web productivity, and interfere with water conveyance and flood control systems. Lower dissolved oxygen levels have been documented under water hyacinth canopies, and these conditions might be exacerbated.

Recommendations:
The DEIS should specifically address the proposal for disposal of wastewater from the entire, built-out project as proposed. Should plans for expanding the local wastewater treatment facility be considered, then this should be analyzed as a connected action to the River Islands Project, and the impacts associated with these facilities should be analyzed as part of this project.

The DEIS should address concerns related to the project regarding the potential of the project to contribute to low levels of dissolved oxygen and elevated salinity levels in the Old River and San Joaquin River waterways. The DEIS should describe the Total Maximum Daily Load (TMDL) standard that is being prepared to address impairments on the San Joaquin River. The Corps should demonstrate that the proposed project will not further impair downstream waterways and should consider marine design modifications, such as location and size, to minimize these environmental impacts.

The DEIS should identify the potential impacts related to the construction, operation, and maintenance of the residential marinas and the perpetual operation of power boats. These may all contribute to the release of pathogens, metals, fuels, and other hazardous chemicals, as well as the significant degradation of receiving waters. Although the Corps will decide whether to permit the proposed marina facilities as part of the proposed project, we recommend analyzing the potential adverse effects of the vessels using the proposed facilities consistent with the findings in *Fox Bay Partners v. United States Corps of Engineers*, 831 F.Supp 605 (N.D. IL 1993).

The DEIS should explore the potential adverse effects on the downstream aquatic system from the proposed diversion of water from the San Joaquin River used to supply water to the lake system during the summer months. These diversions would occur at a time when water quality on the San Joaquin River is particularly impaired by low flows, high temperatures, low dissolved oxygen, and high salinity. The DEIS should also identify methods of controlling the spread of non-native, invasive, and harmful plant species, such as Egeria and water hyacinth.

Cumulative Impacts

Important resources are provided by the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) region, including providing drinking water for 22 million people, habitat for 750 plant and animal species, and support for California's $27 billion agricultural industry. There are multiple stressors in the area, including water diversions, discharges of pollutants from urban, suburban, and agricultural areas, intensive modification of habitats and waterways, and the introduction and spread of non-native, invasive species.

Recommendations:
EPA recommends that the DEIS include a comprehensive analysis of the impacts of the proposed development to the aquatic resources of this region, including a description of the historical adverse effects to aquatic resources in the project area and the project's cumulative impact to these historical adverse effects. This information should be included in the cumulative impacts section. The DEIS should identify mitigation, as appropriate, and responsible implementing parties.

Range of Alternatives

In the Environmental Impact Report prepared pursuant to California Environmental Quality Act (CEQA), three alternatives were identified. In our previous comments, EPA stated that the range of alternatives analyzed in that document unnecessarily restricts the analysis of a full range of reasonable alternatives. Because of the objective of incorporating water features into the overall development, off-site locations were determined not to be feasible, although they could reduce the potential adverse impacts of the proposed project.

Recommendations:
Additional alternatives that meet the basic project purpose, both on- and off-site, should be explored to inform decisions about the LEDPA. Properties not presently owned by the applicant that could be reasonably obtained, utilized, expanded, or managed must be considered (40 CFR 230.10). Alternatives such as developments located in upland areas, as well as smaller scale facilities should be considered. Although these alternatives may achieve a smaller return on investment than the applicant's preferred alternative, they may be considered practicable for the purposes of permitting under CWA Section 404. Therefore, alternatives that avoid, minimize, and compensate for impacts to waters of the United States should be given preference in the DEIS. In particular, alternatives that completely avoid the discharge of dredged or fill material to waters of the United States should be evaluated in the DEIS.

The DEIS should also explore alternatives that minimize impacts to waters of the United States. These alternatives may include the establishment of a riparian buffer around the entire project site, removal or reduction of power boats and residential marinas, reduction in project size, different housing densities, and reduction in other environmentally damaging elements of the project.

The DEIS should include a clear description of the basic project purpose and need, project alternatives, potential impacts to the environment, and mitigation for these impacts. Particular attention should focus on an evaluation of the environmental impacts of the proposal and alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options for the decisionmaker and the public (40 CFR 1502.14).

Indirect and Cumulative Impacts

NEPA requires evaluation of indirect and cumulative effects which are caused by the action (40 CFR 1508.8(b) and 1508.7). "Indirect effects may include growth-inducing effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."

CEQ regulations also state that the EIS should include the "means to mitigate adverse environmental effects" (40 CFR 1502.16(h)). This provision applies to indirect effects, as well as direct effects, in that induced commercial, industrial, and residential growth can adversely affect water quality, wetlands, and other natural resources.

Recommendations:
All indirect and cumulative impacts associated with the multiple elements of the project design should be addressed, with particular attention paid to the impacts related to downstream and upstream water sources, flooding potential, water quality, and aquatic habitat.

The DEIS should evaluate the cumulative environmental impacts of all reasonably foreseeable actions, including new commercial, industrial, recreational, or residential development and associated transportation projects. The DEIS should identify appropriate mitigation and implementing parties.

Air Quality

The project area is in nonattainment for three National Ambient Air Quality Standards (NAAQS): ozone, carbon monoxide (CO), and particulate matter less than 10 microns in diameter (PM-10). The area is considered "extreme" for 1-hour ozone, "severe" for 8-hour ozone, "serious" for PM-10, and "serious" for CO under the Federal Clean Air Act. Mitigation may be available to reduce the project's air emissions, including PM-10, diesel particulate matter (DPM), and ozone precursors [oxides of nitrogen (NOx) and volatile organic compounds]. Because of the air basin's extreme ozone nonattainment status, it is particularly important to reduce emissions of ozone precursors from this project to the greatest extent feasible. For example, diesel particulate filters, in conjunction with low-sulfur diesel fuel, can substantially reduce DPM emissions from construction equipment, greater than reductions from using the fuel alone or using Tier-4 engines without particulate filters.

Recommendations:
The DEIS should address the feasibility of implementing additional air quality-related mitigation to reduce emissions of DPM and other pollutants from construction.

The DEIS should address the feasibility of a Construction Emissions Mitigation Plan (CEMP). EPA recommends that the following measures be incorporated into the CEMP:

that equipment a) not idle for more than ten minutes; b) not be altered to increase engine horsepower; c) include particulate traps, oxidation catalysts and other suitable control devices on all construction equipment used at the construction site; d) use ultra low sulfur diesel fuel with a sulfur content of 15 parts per million (ppm) or less or other suitable alternative diesel fuel, unless the fuel cannot be reasonably procured in the geographic area; and e) be tuned to the engine manufacturer's specifications in accordance with a defined maintenance schedule. In addition, the CEMP should establish work limitations such as minimizing trips, and providing staging areas for trucks located away from sensitive receptors through appropriate policies and implementation measures.

Environmental Justice

In keeping with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, the EIS should describe the measures taken by the Corps to: 1) fully analyze the environmental effects of the proposed Federal action on low-income or minority communities, and 2) present opportunities for affected communities to provide input into the NEPA process. The DEIS should address the project's consistency with guidance issued by the Council on Environmental Quality (CEQ), "Environmental Justice Under the National Environmental Policy Act." This guidance provides that mitigation in impact statements "should reflect the needs and preferences of affected low-income populations (and) minority populations to the extent practicable."

Of particular concern will be the indirect and cumulative impacts related to the project design elements that are required to remove the project area from the 100-year floodplain. The construction or re-construction of new or existing levees, and the excavation and expansion of the Paradise Cut channel, may have impacts on upstream and downstream residents. The DEIS should demonstrate that effective outreach to upstream and downstream communities concerning potential impacts has been completed prior to completion of the environmental review process.

The DEIS should address whether air mitigation for localized air impacts was developed in consultation with potentially affected communities. Reducing construction-related emissions would be useful in reducing the project's air quality effects to these communities.

Incorporation by Reference

If references to the Environmental Impact Report or other documents are used, the DEIS should provide a summary of critical issues, assumptions, and decisions complete enough to stand alone. This will aid in readability and ensure the use of the most current information available. Previous analyses should be updated to address substantive issues raised during the public scoping process.

Robert C. & Eileen R. Young
2107 Terraza Place
Fullerton, CA 92835

July 26, 2005

Patti Johnson, Project Manager
US Army Corps of Engineers
Sacramento District, Delta Office
1325 J Street, Room 1480
Sacramento, CA 95814-2922

Re: River Islands – Environmental Impact Statement
July 29, 2005

Dear Ms. Johnson:

We are homeowners at 999 Wetherbee Avenue, Manteca in the Wetherbee Lake Subdivision located south of Manteca in San Joaquin County. It is an area of approximately 70 plus homes adjacent to the San Joaquin River and Walthall Slough. Sometimes known as Wetherbee Lake, it is part of Reclamation District #2094 which was established in approximately 1962 or 1963 at the time of the construction of the pumping plant and navigation gate to protect the subdivision from flooding.

The Wetherbee Lake Pumping Plant and Navigation Gate is a part of the Lower San Joaquin River and Tributaries Project and was authorized by the Flood Control Act of December 22, 1944, Public Law 534, 78th Congress, 2nd Session, Section 10. Parallel authorizing legislation by the State of California was contained in Section 33 of the Water Resources Act, Chapter 1514, California Statues of 1945, now Section 12651 of the State Water Code. It was completed under Contract No. DA-04-167-CIVENG-62-68 by Jack Cambell, Inc. from June 8, 1962 to September 10, 1963. The operation and maintenance manual state that the objective of this navigation gate and pumping plant at Wetherbee Lake are, (a) to allow free passage of small boats between Wetherbee Lake and San Joaquin River when the stage of San Joaquin River is lower than the damaging stage in Wetherbee Lake, (b) to prevent flooding around Wetherbee Lake and Walthall Slough by closing the navigation gate and turning on the pumps, and (c) to maintain about 400 acre-feet of sump storage space in Wetherbee Lake and Walthall Slough during those winter periods when the navigation gate is closed.

We request that our property at 999 Wetherbee Avenue, Manteca and the Wetherbee Lake Subdivision be included in the EIR and the effects that the shifting water pressure from the "super" levee will have on potential flooding be thoroughly analyzed. What will be the effect on levees to the south of us and the pumping plant and navigation gate? We would suggest that a secondary protective levee be built around the Wetherbee Lake Subdivision in order to protect it from any effects from high water compromising these existing levees behind our subdivision.

In January 1997, the Perrin Road levee outside of Manteca broke, our home flooded and was under water for two months as were the majority of homes in our subdivision. This break was due to the high flow of water being released from Friant Dam and Don Pedro Dam during a winter of heavy rain and early snow melt due to "pineapple express" storms. This break and the threat of a break on the northern levee between Reclamation District No. 2017 and No. 2094 were the direct result of the high water and heavy releases along with the decrease in the river depth due to silting in past years. During this same period, Stewart Tract flooded because of the high water.

The proposed 300 foot levees for River Islands have the potential of increasing our danger of flooding during high water. We request that our letter be included in the public comments for the July 29, 2005 meeting.

1) We oppose the construction of 300 foot "super" levees which will then cause the river water to put increased pressure on existing levees upstream as well as towards Stockton and Tracy. What will be the impact of this increased water pressure on the levees across the river from River Islands as well as upstream and downstream? Some of these developments adjacent to the San Joaquin River are not currently required to obtain flood insurance.

2) We request that you review the 1962/1963 Army Corps navigation/flood gate project at Walthall Slough and how it will be impacted. Our navigation/flood gate depends on the integrity of the adjacent levees and those to the south. If those levees fail, then our navigation/flood gate system to maintain the water level surrounding our home will be ineffective.

3) We question the excavation of an artificial lake in the middle of Stewart Tract that is part of the flood protection plan. Stewart Tract has historically flooded naturally during times of high water to relieve pressure on other areas. A lake already filled with water for the viewing pleasure of the million-dollar homeowners will provide minimal, if any form of flood protection if it is already filled with water.

4) There previously was some mention of increasing the capacity of Paradise Cut. The 1997 flood overflowed Paradise Cut and flooded an extended area toward Tracy. The City of Manteca was threatened with flooding on the east side of the San Joaquin River. Paradise Cut was also built by the Army Corps of Engineers. How about dusting off those plans and see where we stand now with that project. Has it done what it was supposed to do?

5) In the May 30, 2005 Stockton Record, Susan Dell'Osso states that the River Islands "super" levee would be impervious to erosion and burrowing animals. We would like to know how she is going to accomplish this. These animals are a continual threat to all the levees along the San Joaquin River. Why will these levees be different?

6) ALL developments in the flood plain (defined as an area that has previously flooded) should be required to carry flood insurance regardless of the so-called fail-safe improvements to guard against flooding. That should include all homes in the planned 11,000 home development of River Islands, Lathrop as well as some of the other planned developments along between the San Joaquin River and Interstate I-5. The State of California was recently held responsible for $45 million in a court settlement as a result of levee failure in the 1997 flooding in Yuba County.

7) Part of the flooding problem is the silt in the river which has accumulated over the last 40 years. This part of the river from the San Joaquin Deep Water Channel to Sturgeon Bend

was regularly dredged to maintain the depth. That has not been done for many years. Walthall Slough needs to be dredged regularly in order to help maintain water storage behind the pumping plant and flood gate during times of high water. The water storage capacity behind the flood gate is presently severely compromised. The water depth has been compromised by the water hyacinth invasion which have died and layered the bottom as well as from silt and run-off from area farms.

8) In addition to our concerns regarding flooding, what will be the impact of 11,000 homes, many with boats and possible water access on the San Joaquin River and Old River. In a "normal" summer the river is narrow, shallow and subject to the tides twice a day. Old River is already closed off every year for a number of months limiting the access to that portion of the Delta. In years past we could make a full loop from Mossdale to the "Y" along the San Joaquin River to the Deep Water Channel and then make the loop back through Discovery Bay, Old River, Tracy and back to the "Y" all year.

9) What is the impact of 11,000 homes with regard to traffic along 205 and I-5 as well as the 120 Bypass? How will that impact our ability to reach the Mossdale launching ramp in order to launch our boat? On Sunday afternoons traffic is backed up on the 120 Bypass and we have to wait in bumper to bumper traffic to get to the launch ramp to take our boat out. Has there been a traffic study to project the number of vehicles this project will put on the surrounding roads? What is the effect of auto pollution on the areas surrounding the river? Is there adequate parking there for this increase in population?

10) What would be the impact on water and sewage if any portion of these super levees failed?

11) An extraordinary amount of farmland is being bulldozed for concrete and asphalt along the center corridor of the San Joaquin Valley. What is the amount of farmland that is being taken out of production?

May we call attention to the following:

"'Most people do not comprehend the level of financial risk they face living behind a levee,' said Doug Plasencia, an engineer and flood-risk expert based in Arizona. You are talking about people losing serious assests that they might be looking toward for retirement.'" Stockton Record, May 30, 2005.

"Flood experts, such as state Board of Reclamation General Manager Pete Rabbon, say a house behind a levee offering the "100-year" protection has a better than one-in-four chance of being damaged or destroyed by flood over 30 years, the length of a typical mortgage. That is more than twice the risk that the same homeowner has of losing his or her home to fire." Stockton Record, May 30, 2005.

"Fema's 100-year standard is a mathematical best guess made by combining historic flood date with a guess on the reliability of the local levees. It has been expanded several times because the area continues to get bigger and badder storms, and it has its critics." Stockton Record, May 30, 2005.

"Ronald Stork of the Friends of the River says the standard is too crude to hang so much on it. 'All this is very interesting, Stork said. But what communities want to know is Is it safe to build

here? Will this community survive? And the FEMA equation doesn't answer this question." Stockton Record, May 30, 2005.

"The problem, according to Eric Parfrey of the Mother Lode branch of the Sierra Club, is that River Islands' strength would exploit any weakness in downstream levees. Think of the armored island as a giant rock in a stream; it makes a flood flow faster around it. This added pressure could cause nearby levees – many of which are maintained to lower agricultural standards – to collapse. 'It just pushes the problem downstream,' Parfrey said." Stockton Record, May 30, 2005. We also might add that it pushes the problem upstream in our direction as well.

"Flooding of the San Joaquin Valley is inevitable because it is a flood basin, a place where water naturally accumulates. But experts say there are ways to prevent the periodic deluges from drowning people, wrecking subdivisions and leaving taxpayers with huge bills. – Build bigger levees and set them back from river channels to give the water room to spread. -Buy up buildings or use easements on open land to make room for wider levees or emergency floodways. –Require homeowners to buy flood insurance and force developers to elevate houses above flood level. -Ban home construction in low-lying flood zones." Stockton Record, May 31, 2005.

Our subdivision had a history of flooding until 1963 when the US Army Corps of Engineers built the pumping plant and navigation gate on Walthall Slough. During times of high water the flood gate is lowered and water is pumped from our side of the slough to the other side into the San Joaquin River to maintain the water level on our subdivision side. We were protected for close to 40 years by this multi-million dollar flood protection project during periods of high water. It is our fear that this flood/navigation gate will be compromised by the instability of the surrounding levees to protect us from the effects of the River Islands development during periods of high water.

We request that we be placed on all mailing lists for notification regarding this project and any action by the US Army Corps of Engineers or any other government agency in this portion of the Delta with regard to flooding.

Sincerely yours,

Robert C. Young

Eileen R. Young

Johnson, Patti P SPK

From: ''leener Richarads [richardsaj@yahoo.com]
Sent: 'riday, June 17, 2005 7:21 AM
To: ohnson, Patti P SPK
Subject: River Island building.

To the Representative of the Army Core of Engineers:

The need to build in the area of the delta island is bad thinking.I know the intent to build a levee much stronger than the existing one is planned.One of the most powerfull forces on this earth is water.Earth and gravel damns have many flaws and weaknesses in their construction.Snow run-off and rain is a consistant power to deal with in flooding situations.The existing levees have had to be constantly built up to prevent a dangerous situation.These levees have broken through before and flooded many acres of land and homes.First and foremost, is in the protection of human lives, not the interests of the city and developers need to build.Developers could care less about where they build.

The building of these homes and commercial interest ,will force the need to increase the amount of waste dumped into the San Joaquin River.The need to keep the water quality as pure as possible for the fish and birds and wildlife is essential.A contaminated river is useless.It took years to clean-up the Hudson river ,so the fish would return.The salmon are few in numbers, compared to what it use to be. The need to keep the water clean, will increase the return of these fish. Striped bass also spawn in this area, as well as other species.I feel the risk to human lives, and the depletion of fish and wildlife, makes this a bad area to be considered .It is my contention that this permit s/b denied.

Fleener Richards
701 Bobcat Ln
Manteca Ca.
95336

From: Tom Williams [ctwiliams@yahoo.com]
Sent: Saturday, June 25, 2005 4:31 AM
To: Johnson, Patti P SPK
Subject: River Islands Scoping Meeting - Public Notice Number: ' :500412A

Attachments: 4062045612-riverislandsResponse.doc

riverislandsRespons
e.doc (44 K...

From: Dr. Tom Williams
Managing Director, Dubai Isles Development.
700A Howe St.
San Mateo California 94401
011-971-50-559-0210 (Date to 1 July)
650-558-9590
323-528-4687
ctwiliams@yahoo.com

See below/same as attached - make sure Dr. Tom Williams

TO: Patti Johnson, Project Manager
US Army Corps of Engineers,
Sacramento District,
Delta Office 1325 J Street,
Room 1480 Sacramento, California 95814-2922
Email: patti.p.johnson@usace.army.mil

RE: Draft Environmental Impact Statement (DEIS) Proposed River Islands project, San Joaquin County, Public Notice Number: 199500412A
Date: June 10, 2005, Comments Due: July 29, 2005 Initial Comments

The following items have raised concerns with regard to the application for permit. These are initial comments and may be modified with additional information to be provided prior to the close of the review period. I am in the process of coordinating with others in regard to review of this permit application review.

Email and digital materials are far more effective even as pdf files for all future communications and notices.

Thank You for your kind considerations for the below.

Dr. Tom Williams

1. Previous List of Issues
As indicated in the Notice I thoroughly agree and support the identified areas of concern which must be addressed in the EIS and add various concerns and further elaboration of the issues identified:

Major changes in the operation and maintenance of a Federal flood control project, River Navigation – velocities, siltation, and levee erosion, Upstream and downstream hydrology for flood and drought conditions Water quality – based on thorough modeling of the Delta including the above conditions Wetlands and endangered species Agricultural resources, Air quality as affected by traffic below.
Transportation including thorough Traffic Impact Assessments for the entire allocation area where traffic would increase by 500 vphr or 5% or degrade LOS Cultural resources

2. Additional Issues for EIS
I request that the following issues be added to those above for the scope of the EIS:

Geological conditions in the Delta are severe and "super-levees" and other weighting of the surface and especially when loads are released and create unfavorable changes in the underlying Quaternary sediments – sedimentary deposit responses to loading and unloading should be considered, same also for dredging of new deeper, wider channels; Although in the Central Valley axis, seismic and tectonic activities have been significant during the last 12 million years and a thorough study of seismic impacts and effects of seismically induced failures of surface structures; Liquefaction during seismic events; Stormwater runoff from the project and other project affected areas, its treatment, and discharges to Waters of the US and their effects; Thorough, funded, and bonded Monitoring and Mitigation Plan for all moderate and significant impacts.

3. Clearly Defined and Supported "Benefits"
The Notice indicates major ambiguities which should have been resolved prior to opening applications:
"The River Islands project purpose is to construct a large-scale, mixed-use project consisting of residential development, a commercial complex, and MAY include open space and recreational amenities,…".

Additional Issue for EIS Full landuse documentation must be provided without the above ambiguities and its related utilities, services, and transportation levels of services and related required supporting facilities – along with their impacts (Master EIR or Tiered EIR should have been done).

4. Economics
As a permit application and the supporting EIS typically reference the importance of economic benefits and review-assessment, sufficient economic information is critical to comparisons of benefits and detriments.

Additional Issue for EIS: Thorough economic evaluation and assessment including bonding by the city and project. Benefits are referenced and benefit/detriment comparisons will be mentioned.
Thorough economic review and commitments are required in order to judge the economic impacts and benefits of the project.

Additional Issue for EIS: Alternatives and costs related to "Do Nothing" or "Do Elsewhere" alternatives should be included.

5. Agency Interdependency
The Project has numerous interdependencies which require documentation and full disclosure and have not been clearly presented. The City and the Developer have a complicated relationship which should be documented and clarified in the EIS. See attached.

Additional Issue for EIS: Documentation of previous environmental studies and their MMP and other requirements need to be presented.

6. CoE Coordination with Applicant
Based on readily available internet sources, representatives of the applicant claim many aspects regarding previous CEQA and current CoE activities which should be documented and made available. See attached.

Additional Issue for EIS: I therefore also request that all prior and subsequent dealings with the applicant, their representatives, and their consultants be thoroughly documented and updated throughout the preparation process beginning with circulation of the minutes for the Scoping Meeting.

I deeply appreciate the receipt of the Notice of the Scoping Meeting, but due to other commitments overseas I will be unable to participate and assist in those on the 29th June.

Dr. Tom Williams, Ph.D., UC Berkeley

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Morrison and Foerster Webpage

River Islands, Lathrop, San Joaquin County Ongoing since May 1995

Assisting the developer of a 6,000-acre island in the San Joaquin River delta in the environmental review and permitting of an innovative master-planned community and fisheries restoration project.

We assisted with local planning and CEQA review, and currently are working with the Army Corps of Engineers and other agencies on a plan to breach existing levees and reestablish aquatic habitat on large portions of the island.

Morrison & Foerster attorneys also represented River Islands LLC in a CEQA challenge to the City of Lathrop's approval of River Islands' permits to construct a major new mixed use development including 11,000 new homes.

Working closely with counsel for the City, we settled this matter ON VERY FAVORABLE TERMS THAT WILL ALLOW THE PROJECT TO GO FORWARD WITHOUT ADDITIONAL CEQA REVIEW.

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Appendix B – Biological Technical Resources

Appendix B-1
Special-Status Wildlife Species

Table B-1. Special-Status Wildlife Species with the Potential to Occur in the Vicinity of River Islands at Lathrop

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
Invertebrates					
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/–	Streamside habitats below 3,000 feet throughout the Central Valley.	Riparian and oak savanna habitats with elderberry shrubs; elderberries are the host plant.	High	Elderberry shrubs in project area.
Conservancy fairy shrimp *Branchinecta conservatio*	E/–	Disjunct occurrences in Solano, Merced, Tehama, Ventura, Butte, and Glenn Counties.	Large, deep vernal pools in annual grasslands.	Low	Outside of species range.
Vernal pool fairy shrimp *Branchinecta lynchi*	T/–	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County. Isolated populations also in Riverside County.	Common in vernal pools; also found in sandstone rock outcrop pools.	Low	No vernal pools or suitable seasonal wetland habitats in project area.
Moestan blister beetle *Lytta moesta*	–/–	Central California. The species was collected in Kern and Tulare counties in the 1930s. The historical distribution also includes Fresno, Madera, Santa Cruz, and Stanislaus Counties.	Adult meloids are often found on flowers. There is no published information on habitat or floral visitation records for *Lytta moesta.*	Low	Outside of species range.
Sacramento anthicid beetle *Anthicus sacramento*	–/–	*Anthicus sacramento* is found in several locations along the Sacramento and San Joaquin rivers, from Shasta to San Joaquin counties, and at one site along the Feather River at Nicolaus.	Interior sand dunes and sand bars; has also been found in dredge spoil heaps.	Low	No suitable sand dune habitat in project area.
Reptiles					
Western pond turtle *Actinemys marmorata*	–/SSC	Northwestern subspecies occurs from the Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley, and on the western slope of Sierra Nevada.	Occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands, and open forests.	High	Suitable aquatic and upland habitat in project area.

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
		Southwestern subspecies occurs along the central coast of California east to the Sierra Nevada and along the southern California coast inland to the Mojave and Sonora Deserts; range overlaps with that of the northwestern pond turtle throughout the Delta and in the Central Valley.	Woodlands, grasslands, and open forests; aquatic habitats, such as ponds, marshes, or streams, with rocky or muddy bottoms and vegetation for cover and food.		
Giant garter snake *Thamnophis gigas*	T/T	Central Valley from the vicinity of Burrel in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno.	Sloughs, canals, low gradient streams and freshwater marsh habitats where there is a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter.	Moderate	Suitable aquatic and upland habitat in project area.
San Joaquin whipsnake *Masticophis flagellum ruddocki*	–/SSC	Occurs primarily from the Delta region southward in the San Joaquin Valley and the Coast Ranges to Kern and Santa Barbara counties.	This species is known from a variety of habitats, including grassland, savanna, chaparral, and woodland.	Low	No suitable habitat in project area.
Coast horned lizard *Phrynosoma blainvillii*	–/SSC	Historically found along the Pacific coast from the Baja California border west of the deserts and the Sierra Nevada, north to the Bay Area, and inland as far north as Shasta Reservoir, and south into Baja California. Ranges up onto the Kern Plateau east of the crest of the Sierra Nevada. Current range is more fragmented.	Inhabits open areas of sandy soil and low vegetation in valleys, foothills and semiarid mountains from sea level to 8,000 ft. (2,438 m) in elevation. Found in grasslands, coniferous forests, woodlands, and chaparral, with open areas and patches of loose soil. Often found in lowlands along sandy washes with scattered shrubs and along dirt roads, and frequently found near ant hills.	Low	No suitable habitat in project area.

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
Amphibians					
California tiger salamander *Ambystoma californiense*	T/SSC	Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet, and coastal region from Butte County south to northeastern San Luis Obispo County.	Small ponds, lakes, or vernal pools in grass-lands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy.	Low	No suitable habitat in project area. No documented occurrences in region.
Foothill yellow-legged frog *Rana boylii*	–/SSC	Occurs in the Coast Ranges from the Oregon border south to the Transverse Mountains in Los Angeles Co., in most of northern California west of the Cascade crest, and along the western flank of the Sierra south to Kern Co. Livezey (1963) reported an isolated population in San Joaquin Co. on the floor of the Central Valley. Isolated populations are also known from the mountains of Los Angeles County.	Found in or near rocky streams in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types.	Low	No suitable stream habitat in project area.
Western spadefoot *Spea hammondii*	–/SSC	Occurs throughout the Central Valley and the Coast Ranges and along the coastal lowlands from San Francisco Bay to Mexico.	Typically inhabit lowland habitats such as washes, floodplains of rivers, alluvial fans, playas, and alkali flats. Select areas with sandy or gravelly soil with open vegetation and short grasses. Vegetation communities where this species may occur include valley and foothill grasslands, open chaparral, and pine-oak woodlands.	Low	No documented occurrences or vernal pool habitat in the region.
California red-legged frog *Rana draytonii*	T/SSC	Found along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.	Permanent and semipermanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation. May aestivate in rodent burrows or cracks during dry periods.	Low	Outside of species range.

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
Birds					
Tricolored blackbird *Agelaius tricolor*	–/SSC	Permanent resident in the Central Valley from Butte County to Kern County. Breeds at scattered coastal locations from Marin County south to San Diego County; and at scattered locations in Lake, Sonoma, and Solano Counties. Rare nester in Siskiyou, Modoc, and Lassen Counties.	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles. Forages in grassland and agricultural fields.	High (foraging); Low (nesting)	Suitable foraging habitat available in project area.
Western burrowing owl *Athene cunicularia hypugea*	–/SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas. Rare along south coast.	Grasslands and agricultural fields with available burrows.	High (foraging); Low (nesting)	Suitable foraging habitat available in project area. Limited nesting habitat in project area.
Swainson's hawk *Buteo swainsoni*	–/T	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. Highest nesting densities occur near Davis and Woodland, Yolo County.	Nests in oaks or cottonwoods in or near riparian habitats. Forages in grasslands, irrigated pastures, and grain fields.	High	Several occurrences in and near project area.
Mountain plover *Charadrius montanus*	–/SSC	Winters in California. Sacramento, San Joaquin, and Imperial Valleys are believed to support the greatest number of wintering mountain plovers.	Occupies open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water are not needed; may use newly plowed or sprouting grainfields.	Low	Potential foraging habitat during the winter months, though habitat suitability is low.
Northern harrier *Circus cyaneus*	–/SSC	Occurs throughout lowland California. Has been recorded in fall at high elevations.	Grasslands, meadows, marshes, and seasonal and agricultural wetlands.	High	Suitable nesting as foraging habitat in project area.
Yellow warbler *Dendroica petechia brewsteri*	–/SSC	Largely absent from the Central Valley and southern and eastern desert areas of California.	Nest in riparian habitat, especially willows.	Moderate	Suitable nesting habitat along Paradise Cut.

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
White-tailed kite *Elanus leucurus*	–/FP	Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border.	Low foothills or valley areas with valley or live oaks, riparian areas, agricultural lands, and marshes near open grasslands for foraging. Nest in isolated trees or small woodland patches	High	Suitable nesting habitat along Paradise Cut and foraging habitat throughout project area.
Greater sandhill crane *Grus canadensis tabida*	–/T, FP	Winter range includes central California.	Summers in open terrain near shallow lakes or freshwater marshes. Winters in plains and valleys near bodies of fresh water.	Moderate (foraging), wintering habitat only	Suitable foraging habitat in agricultural fields on site.
Yellow-breasted chat *Icteria virens*	–/SSC	In California, present in varied numbers and habitats. Most numerous in northwest, where uncommon from Klamath Mountains region west to inner Northern Coast Range and south to San Francisco Bay area; very locally distributed throughout Southern Coast Range and Peninsular Range from Santa Clara County south to San Diego County; declining in Sacramento and San Joaquin Valleys; rare and local along rivers along western slope of Sierra Nevada from Feather River south to Kern River.	Riparian woodland with dense shrub cover	Moderate	Suitable nesting habitat along Paradise Cut and foraging habitat throughout project area.
Cackling (=Aleutian Canada) goose *Branta hutchinsii leucopareia*	Delisted/–	Winters throughout California except largely absent from desert region of east-central and southeast California.	In coastal areas, inhabits mudflats, shallow tidal waters, and salt-water marshes with extensive beds of bulrush and cord grass near or adjacent to agricultural fields of grain or cover crops; inland, on wet grasslands, freshwater marshes, lakes, reservoirs, and rivers within easy flying distance of agricultural fields.	Moderate	Foraging habitat available in agricultural lands in project area. Limited nesting potential. Included in the general discussion about migratory birds.

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/E	Breeding populations of greater than five pairs which persist every year in California are currently limited to the Sacramento River from Red Bluff to Colusa and the South Fork Kern River from Isabella Reservoir to Canebrake Ecological Reserve. Other sites where small populations of cuckoos (<5 pairs) breed or possibly breed (but not necessarily every year) are: The Feather River from Oroville to Verona, Butte, Yuba and Sutter counties; San Bernardino and Riverside counties; Inyo County; Los Angeles County; San Bernardino County; Imperial County.	Prefers open woodland with clearings and low, dense, scrubby vegetation; often associated with watercourses. Generally absent from heavily forested areas and large urban areas.	Low	Outside of species current range.
California horned lark *Eremophila alpestris actia*	–/–	Year round resident throughout California.	A common to abundant resident in a variety of open habitats, usually where trees and large shrubs are absent. Found from grasslands along the coast and deserts near sea level to alpine dwarf-shrub habitat above treeline. Less common in mountain regions, on the North Coast and in coniferous or chaparral habitats.	Moderate	Foraging and nesting habitat available in the project area. Included in the general discussion about migratory birds.
Merlin *Falco columbarius*	–/–	Throughout California during nonbreeding season.	Prefers open to semi-open areas. In general, they prefer a mix of low and medium-height vegetation with some trees, and avoid dense forests as well as treeless arid regions.	Low	Low nesting potential with some foraging habitat available. Included in the general discussion about migratory birds.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	–/SSC	Found year round in California.	Nest primarily in dense, tall or moderately tall emergent wetland vegetation in freshwater marshes.	Moderate	Foraging habitat available in project area. Nesting habitat is limited.

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
Loggerhead shrike *Lanius ludovicianus*	–/SSC	Found year round in California.	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches.	Moderate	Suitable foraging habitat with some nesting potential.
American white pelican *Pelecanus erythrorhinchs*	–/SSC	Pacific coast from central California and southern Arizona south to Baja California	Habitat includes rivers, lakes, reservoirs, estuaries, bays, and open marshes, sometimes inshore marine habitats. Pelicans rest/roost on islands and peninsulas.	Low; roosting and foraging habitat only	Some roosting or loafing habitat but species is unlikely to nest in the project area since it is inland.
Mammals					
Townsend's big-eared bat *Corynorhinus townsendii*	–/SSC	Western United States, northward to British Columbia, as far east as the Rocky Mountain States.	Oak savanna, riparian, and grassland; roosts in caves, buildings and mines	Moderate	Foraging habitat present. No identified roost sites.
Greater western mastiff-bat *Eumops perotis californicus*	–/SSC		Found in a wide variety of habitats from desert scrub to montane conifer. Roosts and breeds in deep, narrow rock crevices, but may also use crevices in trees, buildings, and tunnels.	Moderate	Foraging habitat present. No identified roost sites.
Red bat *Lasiurus blossevillii*	–/SSC	Common in some areas of California, occurring from Shasta County to the Mexican border, west of the Sierra Nevada/Cascade crest and deserts. The winter range includes western lowlands and coastal regions south of San Francisco Bay.	Wooded areas at lower elevations; typically roosts in snags and trees with moderately dense canopies	Moderate	Foraging habitat present. No identified roost sites.
Pallid bat *Antrozous pallidus*	–/SSC	Locally common species of low elevations in California. Occurs throughout California except for the high Sierra Nevada from Shasta to Kern counties, and the northwestern corner of the state from Del Norte and western Siskiyou counties to northern Mendocino County.	A wide variety of habitats is occupied, including grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. The species is most common in open, dry habitats with rocky areas for roosting.	Moderate	Foraging habitat present. No identified roost sites. One historical CNDDB documented occurrence.

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Riparian (= San Joaquin) woodrat *Neotoma fuscipes riparia*	E/SSC	Occurs throughout California.	Most abundant where shrub cover is dense and least abundant in open areas. In riparian areas, highest densities of woodrats and their houses are often encountered in willow thickets with an oak overstory. They are common where there are deciduous valley oaks, but few live oaks.	Low	Shrub cover not contiguous enough to support species.
San Joaquin pocket mouse *Perognathus inornatus inornatus*	–/–	Found in the Central and Salinas valleys.	Occurs in dry, open grasslands or scrub areas on fine-textured soils between 350 and 600 m (1,100 and 2,000 ft)	Low	Habitat is likely too wet for species.
American badger *Taxidea taxus*	–/SSC	Occurs at low population levels throughout most of the state, with the exception of the north coast	Generally found in treeless regions, prairies, and cold desert areas in the drier open stages of most shrub, forest, and herbaceous habitats with friable soils	Low	No recent occurrences project area. Some regional occurrences from have been documented. High water table could be limiting factor for this burrowing species.
San Joaquin kit fox *Vulpes macrotis mutica*	E/T	Principally occurs in the San Joaquin Valley and adjacent open foothills to the west; recent records from 17 counties extending from Kern County to Contra Costa County.	Saltbush scrub, grassland, oak, savanna, and freshwater scrub.	Low	No recent occurrences project area. Some regional occurrences from have been documented. Outside of known range. High water table could be limiting factor for this burrowing species.

Common Name *Scientific Name*	Status[1] Federal/State	California Distribution	Habitat	Likelihood of Occurrence in Project Area	Comments
Riparian brush rabbit *Sylvilagus bachmani riparius*	E/E	Historically, have occurred in riparian forests along the San Joaquin River and Stanislaus rivers in Stanislaus and San Joaquin counties. Also occupied streamside communities along the other tributaries of the San Joaquin River on the Valley floor. Largest remaining fragment of habitat and only extant population are found along the Stanislaus River in Caswell Memorial State Park, San Joaquin County, California. No other sightings of riparian brush rabbits outside the Park have been reported in over 40 years.	Native valley riparian habitats with large clumps of dense shrubs, low-growing vines, and some tall shrubs and trees.	High in the PCC and PCIP Areas; no suitable habitat in the RID	Suitable habitat along San Joaquin River and Paradise Cut.

Source: California Department of Fish and Game 2010

[1] Status code definitions:

U.S. Fish and Wildlife Service (USFWS) Federal Listing Categories

E = Listed as endangered under the federal Endangered Species Act. (legally protected)

T = Listed as threatened under the federal Endangered Species Act. (legally protected)

SC = Species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking (formerly C2 species).

– = No listing status

California Department of Fish and Game (CDFG) State Listing Categories

E = Listed as endangered under the California Endangered Species Act.

T = Listed as threatened under the California Endangered Species Act.

R = Listed as rare under the California Native Plant Protection Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.

– = No listing status

Appendix B-2

Special-Status Plant Species

Table B-2. Special Status Plant Species with the Potential to Occur in the Vicinity of River Islands at Lathrop

Common Name *Scientific Name*	Status[a] USFWS/CDFG/CNPS	California Distribution	Habitat	Blooming Period	Elevation Range (meters)	Likelihood of Occurrence in Project Area	Comments
Santa Clara thorn-mint *Acanthomintha lanceolata*	–/–/4.2	San Francisco Bay area, south Inner Coast Ranges in Alameda, Fresno, Merced, Monterey, San Benito, Santa Clara, San Joaquin, Stanislaus Counties	Rocky sites in chaparral (often serpentine soils), cismontane woodland and coastal scrub	Mar–Jun	80–1,200 meters	No	Habitat not present in the proposed phase 2B area.
Large-flowered fiddleneck *Amsinckia grandiflora*	E/E/1B.1	Historically known from Mount Diablo foothills in Contra Costa, Alameda, and San Joaquin counties; currently known from three natural occurrences	Cismontane woodland, Valley and foothill grassland slopes	Apr–May	275–550 meters	No	Habitat not present in the proposed phase 2B area.
California androsace *Androsace elongata* ssp. *Acuta*	–/–/4.2	Scattered locations throughout California, but primarily in east San Francisco Bay, interior South Coast Ranges, San Joaquin Valley, and southwest California	Moss-covered rock outcrops and open areas in grassland, cismontane woodland, chaparral, pinyon-juniper woodland, and coastal scrub	Mar–Jun	150–1,200 meters	No	Habitat not present in the proposed phase 2B area.
Alkali milk-vetch *Astragalus tener* var. *tener*	–/–/1B.2	Southern Sacramento Valley, northern San Joaquin Valley, east San Francisco Bay Area	Playas, on adobe clay in valley and foothill grassland, vernal pools on alkaline soils	Mar–Jun	below 60 meters	No	Habitat not present in the proposed phase 2B area.
Crownscale *Atriplex coronata* var. *coronate*	–/–/4.2	Southern Sacramento Valley, San Joaquin valley, eastern Inner South Coast Ranges	Alkaline soils in chenopod scrub, valley and foothill grassland, vernal pools	Mar–Oct	below 590 meters	No	Habitat not present in the proposed phase 2B area.
San Joaquin spearscale (saltbush) *Atriplex joaquiniana*	–/–/1B.2	West edge of Central Valley from Glenn County to Tulare County	Alkaline soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland	Apr–Oct	below 835 meters	No	Habitat not present in the proposed phase 2B area.
Lesser saltscale *Atriplex minuscule*	–/–/1B.1	Sacramento and San Joaquin Valley, Butte County and from Merced County to Kern County	Sandy alkaline soils in chenopod scrub, playas, valley and foothill grassland	May–Oct	15–200 meters	No	Habitat not present in the proposed phase 2B area.

Common Name *Scientific Name*	Status[a] USFWS/CDFG/CNPS	California Distribution	Habitat	Blooming Period	Elevation Range (meters)	Likelihood of Occurrence in Project Area	Comments
Big tarplant *Blepharizonia plumosa (formerly B. plumosa* ssp. *plumosa)*	–/–/1B.1	San Francisco Bay area, with occurrences in Alameda, Contra Costa, San Joaquin*, Stanislaus, and Solano Counties	Valley and foothill grassland	Jul–Oct	30–505 meters	No	Habitat not present in the proposed phase 2B area.
Round-leaved filaree *California macrophyllum*	–/–/1B.1	Scattered occurrences in the Great Valley, southern North Coast Ranges, San Francisco Bay Area, South Coast Ranges, Channel Islands, Transverse Ranges, and Peninsular Ranges	Cismontane woodland, valley and foothill grassland on clay soils	Mar–May	15–1,200 meters	No	Habitat not present in the proposed phase 2B area.
Bristly sedge *Carex comosa*	–/–/2.1	Scattered occurrences throughout California; Oregon, Washington	Coastal prairie, marshes and swamps at lake margins, valley and foothill grassland	May–Sep	below 625 meters	No	Habitat not present in the proposed phase 2B area.
Parry's red tarplant (formerly Hemizonia) *Centromadia parryissp. rudis*	–/–/4.2	Butte, Colusa, Glenn, Lake, Merced, Sacramento, San Joaquin, Solano, Sutter, Yolo Counties	Alkaline, vernally mesic seeps, sometimes roadsides, in valley and foothill grassland, vernal pools	May–Oct	0–100 meters	No	Habitat not present in the proposed phase 2B area.
Slough thistle *Cirsium crassicaule*	–/–/1B.1	San Joaquin Valley: San Joaquin, Kings and Kern Counties	Chenopod scrub, riparian scrub, sloughs in swamps and marshes	May–Aug	3–100 meters	Yes	Habitat present and historic occurrence documented approximately 0.5 miles from proposed phase 2B area, at the junction of Old River and San Joaquin River.

Common Name *Scientific Name*	Status[a] USFWS/CDFG/CNPS	California Distribution	Habitat	Blooming Period	Elevation Range (meters)	Likelihood of Occurrence in Project Area	Comments
Small-flowered morning-glory *Convolvulus simulans*	–/–/4.2	San Joaquin Valley, central western and southwestern California, southern Channel Islands; Baja California	On clay soils in serpentinite seeps in chaparral openings, coastal scrub, valley and foothill grassland	Mar–Jul	30–700 meters	No	Habitat not present in the proposed phase 2B area.
Palmate-bracted bird's-beak *Cordylanthus palmatus*	E/E/1B.1	Livermore Valley and scattered locations in the Central Valley from Colusa County to Fresno County	Alkaline sites in grassland and chenopod scrub	May–Oct	5–155 meters	No	Habitat not present in the proposed phase 2B area.
Gypsum-loving larkspur *Delphinium gypsophilum* ssp. *gypsophilum*	–/–/4.2	Inner South Coast Ranges, San Joaquin Valley, Tehachapi Mountains, southern Sierra Nevada Foothills	Atriplex scrub, cismontane woodland, grassland	Feb–May	100–825 meters	No	Habitat not present in the proposed phase 2B area.
Recurved larkspur *Delphinium recurvatum*	–/–/1B.2	Central Valley from Colusa* to Kern Counties	Alkaline soils in valley and foothill grassland, saltbush scrub, cismontane woodland	Mar–Jun	below 750 meters	No	Habitat not present in the proposed phase 2B area.
Bay buckwheat *Eriogonum umbellatum* var. *bahiiforme*	–/–/4.2	Western portion of northern California: from Humboldt to Monterey Counties	Rocky, often serpentine substrates in oak woodland and lower montane coniferous forest	Jul–Sep	700–2,200 meters	No	Habitat not present in the proposed phase 2B area.
Delta button-celery *Eryngium racemosum*	–/E/1B.1	San Joaquin River delta, floodplains, and adjacent Sierra Nevada Foothills: Calaveras, Contra Costa, Merced, San Joaquin*, and Stanislaus Counties	Riparian scrub in seasonally inundated depressions on clay soils	Jun–Sep	3–30 meters	Yes	Habitat present and historic occurrence documented approximately 0.5 miles from proposed phase 2B area, where I-5 crosses the San Joaquin River.

Common Name *Scientific Name*	Status[a] USFWS/CDFG/CNPS	California Distribution	Habitat	Blooming Period	Elevation Range (meters)	Likelihood of Occurrence in Project Area	Comments
Diamond-petaled California poppy *Eschscholzia rhombipetala*	–/–/1B.1	Interior foothills of South Coast Ranges from Alameda County to Stanislaus Counties, Carrizo Plain in San Luis Obispo County	On alkaline clay soils in grassland, chenopod scrub, where grass cover is sparse enough to allow growth of low annuals	Mar–Apr	below 975 meters	No	Habitat not present in the proposed phase 2B area.
Hogwallow starfish *Hesperevax caulescens*	–/–/4.2	Alameda, Amador, Butte, Contra Costa, Colusa, Fresno, Glenn, Kern, Merced, Napa, San Diego, San Joaquin, San Luis Obispo, Solano, Stanislaus, Sutter, Tehama, and Yolo Counties	Mesic clay in valley and foothill grassland	Mar–Jun	below 505 meters	No	Habitat not present in the proposed phase 2B area.
Woolly rose mallow (formerly Rose-mallow or California hibiscus) *Hibiscus lasiocarpus*	–/–/2.2	Scattered locations in central California in the Central and southern Sacramento Valley, deltaic Central Valley, from Butte to San Joaquin County	Freshwater marshes along rivers and sloughs	Jun–Sep	below 120 meters	Yes	Habitat present in proposed phase 2B area.
Ferris's goldfields *Lasthenia ferrisiae*	–/–/4.2	Occurs in Alameda, Butte, Contra Costa, Colusa, Fresno, Kings, Kern, Merced, Monterey, Sacramento, San Benito, San Joaquin, San Luis Obispo, Solano, Stanislaus, Tulare, Ventura, and Yolo Counties	Vernal pools on alkaline, clay-based soils	Feb–May	20–700 meters	No	Habitat not present in the proposed phase 2B area.
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	–/–/1B.2	San Francisco Bay region, also part of Central Valley in Alameda, Contra Costa, Napa, Santa Clara*, San Joaquin, Solano, and Sonoma Counties	Coastal and estuarine marshes (freshwater and brackish)	May–Sep	below 4 meters	Yes	Habitat present in proposed phase 2B area.
Serpentine leptosiphon (linanthus) *Leptosiphon ambiguus (Linanthus)*	–/–/4.2	San Francisco Bay area, inner South Coast Ranges in Alameda, Contra Costa, Merced, San Benito, Santa Clara, Santa Cruz, San Joaquin, San Mateo, and Stanislaus Counties	Cismontane woodland, coastal scrub, valley and foothill grassland, usually on serpentine soils	Mar–Jun	120–1,130 meters	No	Habitat not present in the proposed phase 2B area.

Common Name *Scientific Name*	Status[a] USFWS/CDFG/CNPS	California Distribution	Habitat	Blooming Period	Elevation Range (meters)	Likelihood of Occurrence in Project Area	Comments
Mason's lilaeopsis *Lilaeopsis masonii*	–/R/1B.1	Southern Sacramento Valley, Sacramento - San Joaquin River Delta, northeast San Francisco Bay area in Alameda, Contra Costa, Marin, Napa, Sacramento, San Joaquin, and Solano Counties	Freshwater or brackish marsh, riparian scrub, in tidal zone	Apr–Nov	in tidal zone	Yes	Habitat present in proposed phase 2B area.
Delta mudwort *Limosella subulata*	–/–/2.1	Deltaic Central Valley: Contra Costa, Sacramento, San Joaquin, and Solano Counties; Oregon	Muddy or sandy intertidal flats and marshes, streambanks in riparian scrub generally at sea level	May–Aug	generally at sea level	Yes	Habitat present in proposed phase 2B area.
Sierra monardella *Monardella candicans*	–/–/4.3	Sireea Nevada Foothills in Amador, Calaveras, El Dorado, Fresno, Kern, Madera, Mariposa, Nevada, Placer, San Joaquin, Stanislaus, Tulare, and Tuolumne Counties	Sandy or gravelly soils in chaparral, cismontane woodland, lower coniferous forest	Apr–Jul	150–800 meters	No	Habitat not present in the proposed phase 2B area.
Delta woolly-marbles *Psilocarphus brevissimus* var. *multiflorus*	–/–/4.2	Deltaic Central Valley and San Francisco Bay Area, Alameda, Napa, Santa Clara, San Joaquin, Solano, Stanislaus, and Yolo Counties, also reported from San Diego County	Vernal pools	May–Jun	10–500 meters	No	Habitat not present in the proposed phase 2B area.
Sanford's arrowhead *Sagittaria sanfordii*	–/–/1B.2	Scattered locations in Central Valley and Coast Ranges	Freshwater marshes, sloughs, canals, and other slow-moving water habitats	May–Oct	below 610 meters	Yes	Habitat present in proposed phase 2B area.

Common Name *Scientific Name*	Status[a] USFWS/CDFG/CNPS	California Distribution	Habitat	Blooming Period	Elevation Range (meters)	Likelihood of Occurrence in Project Area	Comments
Suisun Marsh aster *Symphyotrichum lentum (formerly A. lentus)*	–/–/1B.2	Sacramento - San Joaquin Delta, Suisun Marsh, Suisun Bay: Contra Costa, Napa, Sacramento, San Joaquin, and Solano Counties	Brackish and freshwater marshes and swamps	May–Nov	below 3 meters	Yes	Habitat present and two historic occurrences documented within approximately 3 miles from proposed phase 2B area.
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	–/–/2.1	Scattered locations in the Central Valley and Southern Coast; Texas	On alkaline soils in floodplains, meadows and seeps, marshes and swamps, riparian forest, vernal pools	May–Sep	5–435 meters	Yes	Habitat present and historic occurrence documented approximately 0.5 miles from proposed phase 2B area, where I-5 crosses the San Joaquin River.
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	–/–/1B.1	Historically known from the northwest San Joaquin Valley and adjacent Coast Range foothills; currently known from Fresno, Monterey, and San Luis Obispo Counties	Grasslands on alkaline hills	Mar–Apr	below 455 meters	No	Habitat present in proposed phase 2B area.

Source: Calflora 2008, CNDDB 2007; CNPS 2007; USFWS 2006a.

[a] Status:

U.S. Fish and Wildlife Service (USFWS) Federal Listing Categories

E = Listed as endangered under the federal Endangered Species Act. (legally protected)

T = Listed as threatened under the federal Endangered Species Act. (legally protected)

SC = Species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking (formerly C2 species).

– = No listing status

California Department of Fish and Game (CDFG) State Listing Categories

E = Listed as endangered under the California Endangered Species Act.

T = Listed as threatened under the California Endangered Species Act.

R = Listed as rare under the California Native Plant Protection Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.

– = No listing status

California Native Plant Society (CNPS) Categories

1A = List 1A species: plants presumed extinct in California.

1B = List 1B species: rare, threatened, or endangered in California and elsewhere.

2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.

3 = List 3 species: plants for which we need more information – Review list

4 = List 3 species: plants of limited distribution – Watch list

Threat Code extensions

1 = Seriously threatened in California (over 80% of occurrences threatened; high degree and immediacy of threat)

2 = Fairly threatened in California (20–80% of occurrences threatened; moderate degree and immediacy of threat)

3 = Not very threatened in California (less than 20% of occurrences threatened or no current threats known)

Appendix B-3

Riparian Brush Rabbit Mitigation and Management Plan

Riparian Brush Rabbit
(*Sylvilagus bachmani riparius*)

Mitigation and Management Plan

River Islands at Lathrop
Lathrop, CA

28 April 2004

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Riparian Brush Rabbit
(*Sylvilagus bachmani riparius*)

Mitigation and Management Plan

River Islands at Lathrop
Lathrop, CA

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28 April 2004

Riparian Brush Rabbit Mitigation and Management Plan
River Islands at Lathrop
Lathrop, CA

Figures

Tables

Appendices

Executive Summary

The River Islands at Lathrop Project is located on Stewart Tract and Paradise Cut in the City of Lathrop, CA. Agriculture is the primary land use on Stewart Tract and Paradise Cut. The project involves the development of commercial and residential parcels on Stewart Tract.

Hydraulic improvements in Paradise Cut for flood control will be implemented for the project. For example, a new channel will be constructed north of the existing north Paradise Cut levee, west of the UPRR. A new high ground levee will be constructed along the north boundary of the new channel. The existing north levee of Paradise Cut will be breached at several locations, creating a series of levee remnants. To protect the new development from flooding, a cross-levee will be constructed across Stewart Tract west of the existing UPRR right-of-way. Implementation of hydraulic improvements and the cross-levee provides opportunities to create new habitat for the riparian brush rabbit (RBR).

Riparian brush rabbit is a federal and state listed endangered species. They live in the dense brush of riparian areas in the San Joaquin Valley. This habitat is periodically flooded. RBR require areas of high ground as a refuge from high water to maintain viable, long-term populations. RBR were discovered in Paradise Cut in 2001. Areas of existing RBR habitat in Paradise Cut occur around the perimeter of agricultural fields and near the toe of levees.

The goals of this RBR Mitigation and Management Plan (Management Plan) are to preserve existing RBR habitat, create new habitat, create flood refugia habitat, provide connectivity between habitats, and to avoid and minimize impacts to RBR during construction and operation of the River Islands project. Preserved habitat in Paradise Cut will be managed in perpetuity by a conservation-oriented third party such as the Joint Powers Authority for the San Joaquin Council of Governments responsible for implementing the San Joaquin Multi-species Habitat Conservation Plan, or another conservation entity.

Construction of the River Islands at Lathrop project will occur in three phases over a 20-year period. Phase 1a: Project Initiation to Year ± 3; Phase 1: ± Year 4 through Year ± 10 (2015); and Phase 2: ± Year 11 through completion at Year ± 20 (2025). Specific RBR habitat creation measures would occur in each phase.

A total of 1.93 acres of RBR habitat would be permanently affected and 36.59 acres would be temporarily affected. Indirect effects would occur from the presence of people and pets. Implementation of this Management Plan will result in the preservation of 86.53 acres of existing habitat and the creation of 281.94 acres of new RBR habitat. An additional 301 acres in Paradise Cut will be made available for future restoration. The total acreage of existing, new, and future habitat is 669.48. Included in the acreage of restored habitat are 24.84 acres of flood refugia habitat that will be created.

The lands proposed to be preserved for RBR in Paradise Cut, the new habitat to be created, and management and monitoring activities to be conducted in perpetuity will contribute to the recovery of the species. This Management Plan will assist the U.S. Fish and Wildlife Service in meeting its Recovery Plan goals for RBR.

I. INTRODUCTION

A. Description of the Proposed River Islands Project

1. Project Location

The River Islands at Lathrop project is located in the City of Lathrop, San Joaquin County, CA (T1&2S, R5&6E, Union Island and Lathrop quadrangles; Figure 1). The River Islands project study area is located on Stewart Tract and includes Paradise Cut. Stewart Tract is an island in the Sacramento-San Joaquin River Delta. Paradise Cut, located south of Stewart Tract, is a floodwater bypass approximately 6.8 miles long between the San Joaquin River and Old River. Figure 2 is an aerial photograph of the study area.

2. Project Description

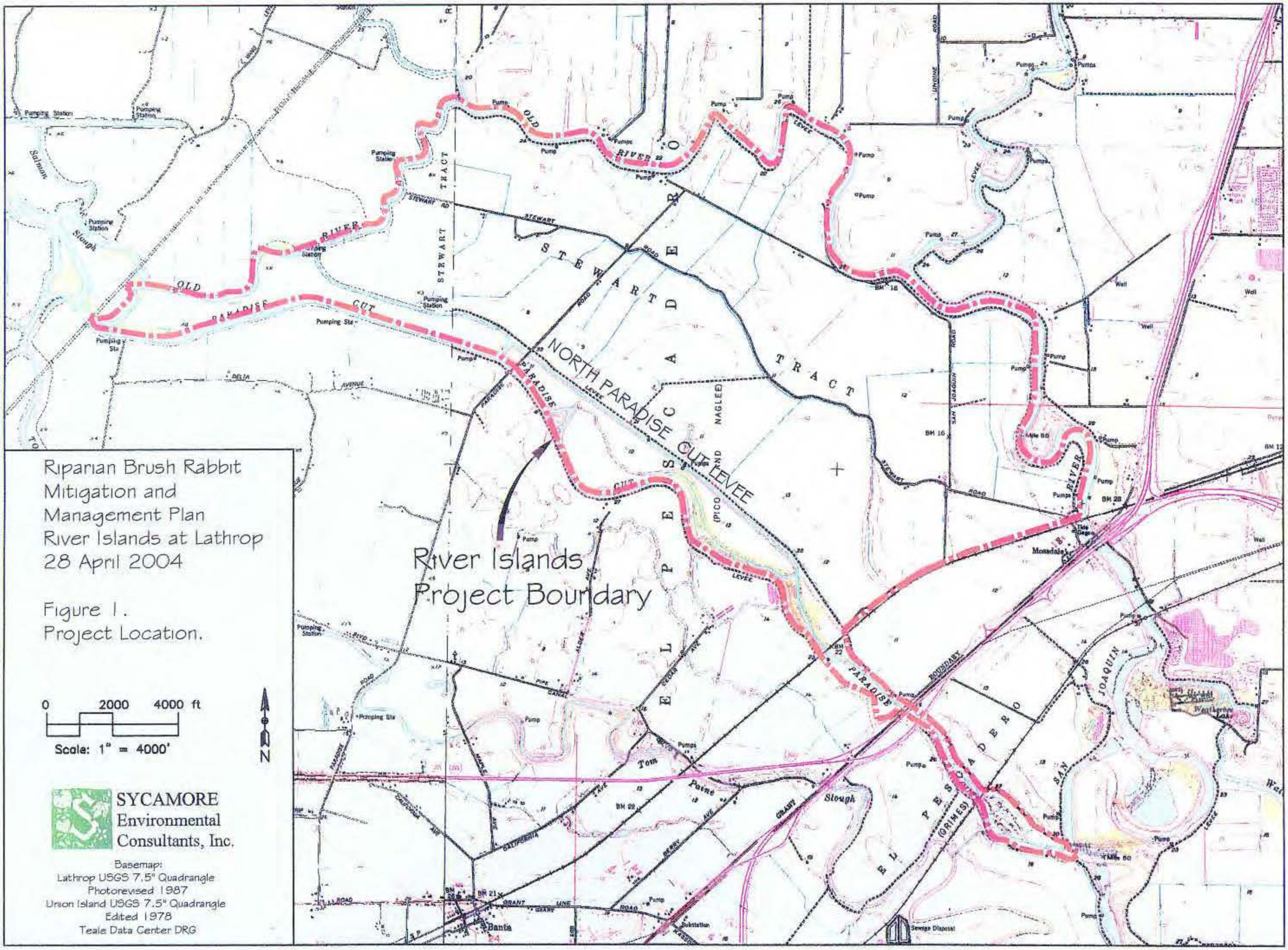
The River Islands project consists of a proposed mix of residential housing, an employment center, and commercial developments with several open space and flood control components (EDAW 2002). General categories include a town center, an employment center, residential areas, lakes, and water features (EDAW 2002). The entire project site covers approximately 4,905 acres on Stewart Tract and Paradise Cut (EDAW 2002).

3. Project Schedule

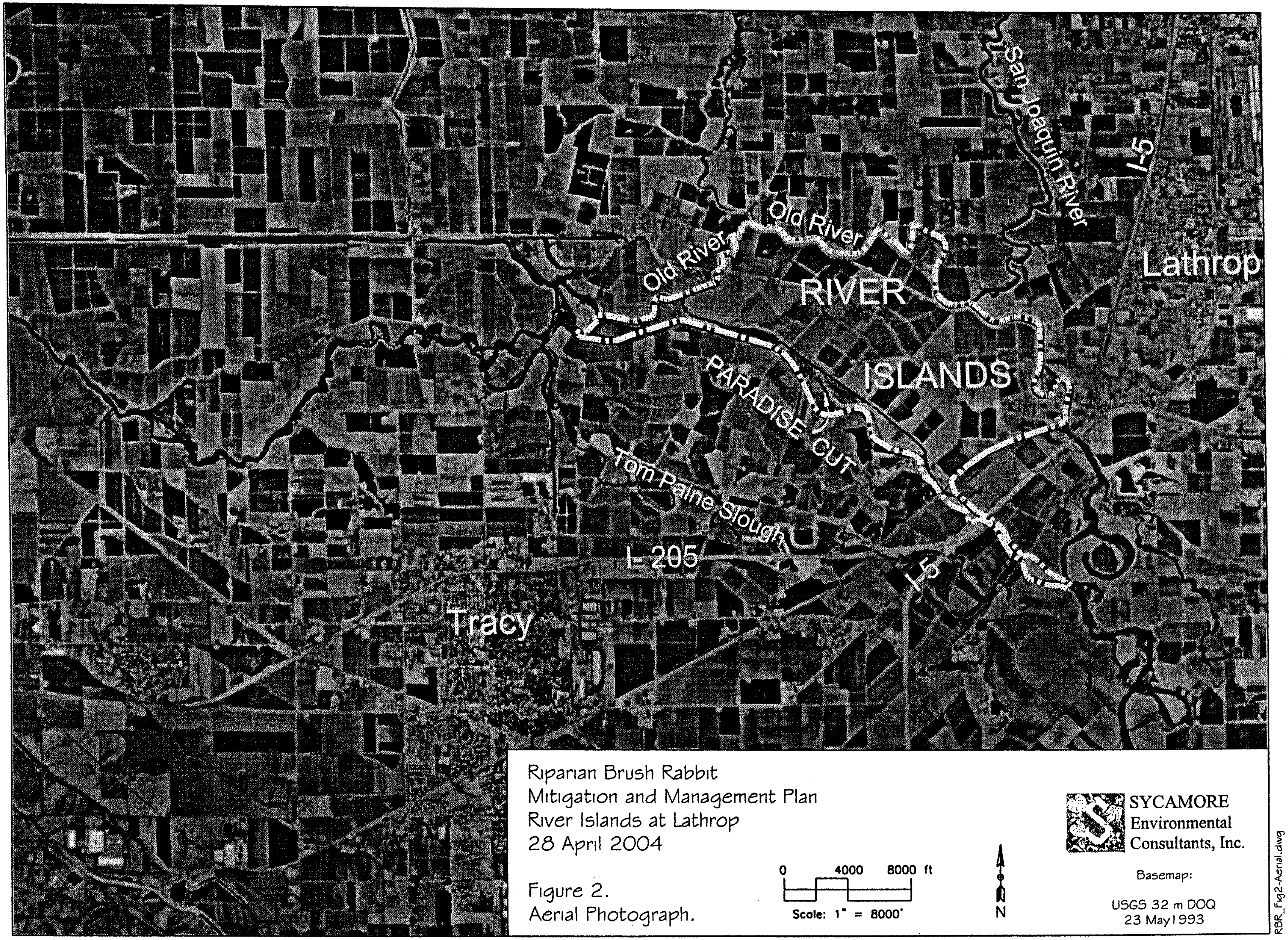
Development of the project has been divided into three phases: Phase 1a, Phase 1, and Phase 2. Phase 1a is project initiation to ± Year 3 and includes a) improvements and modifications to Stewart Road at the at-grade crossing; b) installation of RBR protection measures at the Union Pacific Rail Road (UPRR) crossing at the north Paradise Cut levee for temporary construction access; and c) construction of 800 residential units.

Phase 1 includes construction of the town center, employment center, East Village, Lake Harbor, and Old River Road districts, and various flood control and other project features. Four back bays would be constructed in Phase 1. Phase 1 would start in ± Year 4 and be completed by approximately 2015.

Phase 2, includes constructing the remainder of the project. This Phase would start in ± Year 11 and be completed by 2025. Two golf courses, the West Village, Lakeside, and Woodland's districts, and up to four additional back bays would be constructed.



RBR_Fig1-Location.dwg



Riparian Brush Rabbit
Mitigation and Management Plan
River Islands at Lathrop
28 April 2004

Figure 2.
Aerial Photograph.

4. Mapping

River Islands and its consultants provided the source data for the basemaps used in this Mitigation and Management Plan. Aerial Photomapping Services produced the digital aerial photograph, dated 17 December 1998. The Boundary Survey was prepared by Carlton Engineering, Inc., dated 6 December 2001. Topographic contours include a 5-foot contour set that is scaled to 1"=400', dated 13 May 1993, and a 1-foot contour set of the Stewart Tract levees that is scaled to 1"=40', dated 3 May 1996. Both contour sets are from Aerial Photomapping Services. The 5-foot contour set covers all of Stewart Tract and all of Paradise Cut. The 1-foot contour set covers the levees along the San Joaquin and Old Rivers and Paradise Cut from San Joaquin River to Old River. Restoration Unit (RU) 1 and the western half of RU 2 (Figure 3) are not covered by the 1-foot contour set. Sycamore Environmental used AutoCAD® 2002i/Map 5 to incorporate the source data onto the report figures. Acreages of the proposed restoration features were calculated using AutoCAD® functions.

The existing conditions in Paradise Cut are shown on Figure 3, a set of three 11 x 17 sheets at the end Section II. The future conditions of Paradise Cut, including the habitat preserve area (Paradise Cut Preserve), are shown on Figure 7, a set of three 11 x 17 sheets at the end of Section IV. Figure 7 also shows the habitat preserve area ("Paradise Cut Preserve"). Large format (24 x 36 inch) maps of the existing and future conditions are in a jacket at the end of the report.

Figure 3 Sheet 1 shows Lower Paradise Cut, Figure 3 Sheet 2 shows Central Paradise Cut, and Figure 3 Sheet 3 shows Upper Paradise Cut. Lower Paradise Cut is the reach between Paradise Road and Old River. Central Paradise Cut is the reach between the West UPRR right-of-way (ROW) and Paradise Road. Upper Paradise Cut is the reach between the San Joaquin River and the West UPRR ROW.

B. Purpose of the RBR Mitigation and Management Plan and Species Addressed

The River Islands project will directly and indirectly affect habitat of the riparian brush rabbit (*Sylvilagus bachmani riparius*). RBR is a federal- and state-listed endangered species. The purpose of this Management Plan is to describe i) anticipated project impacts to RBR, ii) avoidance measures, iii) the creation, restoration, and preservation (in perpetuity) of RBR habitat.

C. River Islands Mitigation and Management Plans

Two interrelated plans have been prepared that address a specific component of wildlife habitat and vegetation creation activities that would be implemented in Paradise Cut. These are the Paradise Cut Restoration Plan and the Riparian Brush Rabbit Mitigation and Management Plan. These plans were prepared based on consultations with U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (DFG). A Comprehensive Wetland Mitigation and Monitoring Plan and a Shaded Riverine Aquatic Plan will also be prepared.

1. Paradise Cut Restoration Plan

The Paradise Cut Restoration Plan addresses the establishment and monitoring of riparian vegetation in Paradise Cut. The Plan also describes how riparian habitat will be created on levee remnants i) on the existing 4-mile long, north Paradise Cut levee in lower and central Paradise Cut; ii) in the area of the Setback Levee in upper Paradise Cut; and iii) in the bench area and adjacent flood refugia in upper Paradise Cut. The Paradise Cut Restoration Plan will be implemented during phases 1a, 1, and 2.

2. Riparian Brush Rabbit Mitigation and Management Plan

This Riparian Brush Rabbit Mitigation and Management Plan focuses on the creation of new RBR and preservation of existing habitat in the Paradise Cut Preserve. Topics addressed include creation of new high ground (flood refugia), establishment of connectivity of RBR habitat in Paradise Cut, avoidance and minimization of potential impacts to RBR during construction, indirect effects from project development, and the preservation and management of existing and created RBR habitat in perpetuity.

3. Comprehensive Wetland Mitigation and Monitoring Plan

A Comprehensive Wetland Mitigation and Monitoring Plan will be prepared that will focus on the mitigation requirements for project impacts to jurisdictional waters of the U.S. and wetlands. This Plan will be submitted to the U.S. Army Corps of Engineers (Corps) in support of a section 404 Clean Water Act permit.

4. Shaded Riverine Aquatic Plan

A Shaded Riverine Aquatic Plan will be prepared that will focus on creating shaded riverine aquatic (SRA) habitat on the west bank of the San Joaquin River and the south bank of Old River. SRA habitat will benefit fisheries resources.

D. Benefits of this Management Plan

1. Benefits to Riparian Brush Rabbit

The recovery plan for RBR (USFWS 1998) noted that the only known population of RBR was at Caswell Memorial State Park in San Joaquin County. USFWS (1998) also noted that to help prevent the extinction of this species, it is desirable to establish "at least three additional wild populations in the San Joaquin Valley, in restored and expanded suitable habitat within the rabbit's historical range." Implementation of this Management Plan will preserve, improve, and protect the Paradise Cut-Stewart Tract population of RBR in the San Joaquin Valley. This RBR Mitigation and Management Plan and the use of Paradise Cut will help facilitate the recovery of RBR.

The following primary threats to the survival of the RBR were identified in the recovery plan (USFWS 1998):

- The limited area of existing habitat;
- Increased predation from being exposed while taking refuge on cleared levees during flooding;
- Insufficient connectivity between flood refugia;
- Behavioral restrictions, e.g. avoiding open areas, limit this species dispersal ability during flooding; and
- The scarcity of suitable flood refugia.

This Management Plan will benefit RBR by:

- Increasing the acreage of existing habitat;
- Increasing the amount of suitable flood refugia habitat;
- Helping to reduce predation during flood events by vegetating high ground (levee tops); and
- Increasing connectivity between flood refugia habitat.

2. Benefits of this Management Plan for other Listed Species

a) Riparian woodrat

The riparian woodrat (*Neotoma fuscipes riparia*) is a federal endangered species in the Central Valley of California. Riparian woodrats prefer riparian areas that have deciduous valley oaks with few live oaks (USFWS 1998). They are most numerous where shrub cover is dense and in riparian areas with willow thickets with an oak overstory (USFWS 1998). The only known extant population of riparian woodrat is in Caswell Memorial State Park (USFWS 1998). The continued survival of RBR and woodrats is tenuous because riparian habitat within the Park is subject to wildfire and periodic and extensive flooding that exposes these two species to increased predation and potential drowning (USFWS 2002). Riparian woodrat and RBR share similar riparian habitat requirements and thus share the same risks of extinction. Activities that benefit RBR will also benefit riparian woodrat.

Riparian woodrats do not occur in Paradise Cut, but could potentially benefit from the creation of riparian habitat. One of the USFWS Recovery Plan goals for riparian woodrat is to establish three or more areas of occupied habitat each supporting 400 or more individuals, with a total population of 5,000 or more independent individuals (i.e., excluding dependent young) during average years (USFWS 1998). Riparian woodrat could be introduced into Paradise Cut as part of a recovery program implemented by USFWS or other entities. Old River and Middle River are within the historic range of riparian woodrat (USFWS 2002).

Increasing the acreage of existing riparian habitat, increasing the amount of suitable flood refugia habitat, helping to reduce predation during flood events by vegetating high ground, and increasing connectivity between flood refugia habitat will greatly enhance riparian woodrat habitat and reduce the threats to its extinction (USFWS 2002).

b) Giant garter snake (GGS)

The giant garter snake (*Thamnophis gigas*) is a federal threatened species that occupies several locations in the Central Valley. GGS are highly aquatic, but generally prefer smaller watercourses to large rivers such as the Old River or San Joaquin River. Ideal habitat includes open water, emergent vegetation, and uplands for basking, hibernation, and nocturnal use. The open waters of Paradise Cut provide potential foraging habitat for GGS, but no GGS have been observed during focused surveys or during other biological surveys (EDAW 2002).

The Paradise Cut Restoration Plan describes how winter hibernaculae for GGS will be created on levee remnants. A wetland mitigation and monitoring plan is being prepared for the section 404 individual permit. The wetland mitigation and monitoring plan will describe how emergent marsh habitat will be created that would provide potential foraging habitat for GGS.

c) Valley elderberry longhorn beetle (VELB)

Blue elderberry shrubs, habitat for the federal threatened Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), occur at several locations on Stewart Tract and in Paradise Cut. Additional elderberry shrubs will be planted in RBR habitat mitigation areas. The Paradise Cut Restoration Plan (Sycamore Environmental 2004) describes planting plans for elderberry shrubs.

d) Swainson's hawk

Swainson's hawk is a state listed threatened species. Implementation of this Plan will benefit this species by creating additional nesting habitat in Paradise Cut.

E. Definitions and Abbreviations

The project study area and proposed mitigation actions and preservation areas cover a very large and complex area. Numerous unique terms are used to describe existing and proposed features of the River Islands project. A list of terms and definitions is provided to help the reader understand project features and this Management Plan.

1. *Definitions*

bench. An area of land adjacent to the north Paradise Cut levee, west of Paradise Weir in Upper Paradise Cut. The bench has been created by the deposition of sediment (primarily sand) when water in the San Joaquin River flows into Paradise Cut. The bench reduces the hydraulic capacity of Paradise Cut. Lowering the bench will improve water flow.

Central Paradise Cut. The reach between the West UPRR ROW and Paradise Road.

cross-levee. A new 7,860 ft long levee to be constructed west of and parallel to the West UPRR ROW.

ESA. An environmentally sensitive area in a construction zone usually delimited by fencing, caution tape, or flagging.

flood refugia. Areas of high ground during flood events that allow RBR (and other wildlife species) to escape inundated areas. The north and south Paradise Cut levees and the elevated berms in the ROW of the UPRR provide flood refugia under existing conditions. Although these areas provide escape from high water, they currently lack cover above the 100-year flood elevation. Animals stranded at these locations under existing conditions are subject to increased predation potential.

high ground. Land that is not inundated during flood events (i.e., 100-year event), e.g., the top of the Paradise Cut north and south levees.

islands. Areas in Paradise Cut that have limited connections to adjacent levees. They are called "islands" because most of their perimeter is surrounded by water and because during flood events they are temporarily isolated when surrounded by water.

land bridge. A land bridge is a levee segment that is partially breached. This would occur at three locations (Figure 3). The levee at these locations will be lowered which will create a land bridge between the adjacent levee remnants. Land bridges would be inundated during high water conditions.

levee breach. The existing Paradise Cut north levee will be breached at seven locations. The levee will be removed to allow water to flow into the new channel that will be constructed north of this levee. The breaches will be lower than the height of the levee. Partially removed levee segments at three locations will create three land bridges between the adjacent, higher levee remnants.

levee remnant. Eight variable length sections of the existing Paradise Cut north levee that will remain after the levee is breached.

Lower Paradise Cut. The reach between Paradise Road and Old River.

new channel. A channel that will be created between the existing Paradise Cut north levee and the new high ground levee on Stewart Tract.

Paradise Cut North Levee. The north levee separates Paradise Cut from Stewart Tract and will be breached at seven locations leaving eight remnants. The existing north levee will remain in its current alignment. A new levee will be constructed north of the existing levee.

Paradise Cut Restoration Plan. A plan prepared for River Islands that describes how agricultural land in Paradise Cut will be converted into RBR and other species habitat. The plan also describes how the levee remnants on the Paradise Cut north levee will be converted into RBR and other species habitat.

Paradise Cut south levee. The south levee forms the southern boundary of Paradise Cut. This levee will not be affected by the River Islands project.

Paradise Cut. A flood control bypass connecting the San Joaquin River on the east side of Stewart Tract with Old River on the west side located south of Stewart Tract. To facilitate discussion in this Plan, Paradise Cut is divided into three reaches: Lower, Central, and Upper. Also referred to as the "Cut."

Paradise Weir. A rock weir located in the east end of Paradise Cut. This weir separates Paradise Cut from the San Joaquin River. Also called Paradise Dam.

preserve lands. Designated areas in Paradise Cut that will be preserved in perpetuity for RBR habitat.

preserve manager. The person or entity responsible for managing the preserve in perpetuity.

project study area. The area defined in the SEIR (EDAW 2002) for the River Islands at Lathrop project. Includes Paradise Cut and most of Stewart Tract bounded by I-5 on the east, the San Joaquin River on the north, and Old River on the north and west.

RBR habitat. Vegetation that provides cover and suitable forage plants for riparian brush rabbit.

Setback Levee. A new levee that will be constructed about 150 ft north of the existing Paradise Cut north levee, between I-5 and the East UPRR ROW. The Setback Levee will become the new north levee of the Upper Paradise Cut.

SPRR. Southern Pacific Rail Road. The previous owner of the West UPRR ROW. The SPRR name appears on older maps of Stewart Tract.

Stewart Tract pond. The "pond" is an isolated area of open water located on Stewart Tract north of the North Levee. After the new north levee is constructed, the pond will be located north of it.

Upper Paradise Cut. The reach between the San Joaquin River and the West UPRR ROW.

East UPRR. The railroad ROW located east of I-5.

West UPRR. The railroad ROW located west of I-5.

2. *Abbreviations*

cfs. cubic feet per second	RBR. Riparian brush rabbit
DFG. California Department of Fish and Game	ROW. Right-of-Way
Corps. U.S. Army Corps of Engineers	RU. Restoration Unit
EIR. Environmental Impact Report	SEIR. Subsequent EIR
ESA. Environmentally sensitive area	UPRR. Union Pacific Railroad
ESRP. Endangered Species Recovery Program	USFWS. U.S. Fish and Wildlife Service
GGS. Giant garter snake	VELB. Valley elderberry longhorn beetle

II. BASELINE INFORMATION

A. Existing Conditions in Paradise Cut and Stewart Tract

The south and north borders of Paradise Cut are U.S. Army Corps of Engineers project levees. The width of Paradise Cut ranges between 700 ft and 2,400 ft (average of ± 1,000 ft). Paradise Cut includes 1,029.51 acres of islands, levees, channels of open water, agricultural fields, and ruderal areas (Appendix A). Most of the "islands" in Paradise Cut have connections to adjacent levees, but are called islands because under normal circumstances most of their perimeter is surrounded by water. During flood events, they are temporarily inundated.

Stewart Tract is a ± 5,000-acre island in the Sacramento-San Joaquin River Delta. Stewart Tract occurs on mineral soils unlike most Delta islands that are composed of peat soils. Agriculture is the dominant land use on Stewart Tract.

1. Restoration Units in Paradise Cut

To help describe existing conditions and restoration strategies, the islands in Paradise Cut west of the West UPRR ROW were divided into 15 "Restoration Units" (RU). RUs are described in the Paradise Cut Restoration Plan (Sycamore Environmental 2004). The RUs are numbered from west to east (Figure 3). Table 1 summarizes the existing conditions of each RU.

All of the RUs except RU 10 are currently in agricultural use for row and field crops. RU 10 is an unfarmed irrigation drainage swale that is regularly disced. As described in Section V of this Management Plan, RUs will be converted from agriculture to habitat suitable for RBR and other wildlife species.

2. Agriculture

Row and field crops planted in Paradise Cut and on Stewart Tract are rotated between safflower, sugar beets, corn, watermelon, pumpkin, and other row crops. Walnut orchards in RUs 4, 9, 11, 13, 14, and 15 were removed in 2002-2003.

3. Vegetation

The dominant tree species in Paradise Cut are Valley oak, Fremont cottonwood, box elder, and Goodding's black willow. The dominant shrub species include narrow-leaved willow (*Salix exigua*), California rose (*Rosa californica*), Himalayan blackberry (*Rubus discolor*), and California button willow (*Cephalanthus occidentalis* var. *californicus*). California wild grape (*Vitis californica*), a vine, occurs at many locations throughout Paradise Cut.

Table 1. Existing conditions of Restoration Units in Paradise Cut.

Restoration Unit (RU) Number	Perimeter (ft)	Farmed acreage available for habitat creation	Road & open ground	Area of RU available for restoration	Existing RBR habitat adjacent to farmed portion	Total RU acres: Farmed + existing habitat	Elevation: lowest/ highest (ft)	Current Use
1	8,150	59.29	0.00	59.29	27.40	86.69	6.7 / 8.9	Agriculture: Row & field crops
2	7503	58.02	0.95	58.97	9.71	68.68	6.4 / 8.1	Same
3	12,964	61.79	6.14	67.93	8.22	76.15	4.4 / 7.2	Same
4	1,948	4.05	1.35	5.41	0.34	5.75	8.5 / 8.7	Same
5	5,287	30.51	1.74	32.25	3.49	35.74	6.8 / 10.7	Same
6	2,722	2.53	1.80	4.33	1.79	6.12	11.1 / 23.0	Same
7	7,819	61.62	6.33	67.95	1.43	69.38	10.1 / 12.7	Same
8	7,931	44.43	5.72	50.15	2.60	52.75	9.0 / 13.3	Same
9	4,203	9.14	2.05	11.19	0.38	11.58	12.8 / 13.1	Same
10	16,398	28.77	1.02	29.79	0.00	29.79	4.2 / 7.4	Shallow, linear depression
11	4,600	8.43	1.93	10.36	2.48	12.84	10.9 / 13.4	Agriculture: Row & field crops
12	9,189	60.83	5.84	66.67	7.08	73.75	11.4 / 13.8	Same
13	5,845	7.78	0.29	8.07	8.34	16.41	9.0 / 11.7	Same
14	5,449	12.97	1.39	14.37	8.71	23.08	9.1 / 11.8	Same
15	5,701	24.17	2.88	27.05	4.57	31.62	6.1 / 14.2	Same
	Totals:	**474.34**	**39.43**	**513.77**	**86.53**	**600.31**		

4. *Weeds*

Common, nonnative weedy species around the periphery of cultivated agricultural lands in Paradise Cut and Stewart Tract include perennial pepperweed (*Lepidium latifolium*), yellow star-thistle (*Centaurea solstitialis*), fennel (*Foeniculum vulgare*), poison hemlock (*Conium maculatum*), black mustard (*Brassica nigra*), field bindweed (*Convolvulus arvensis*), tree tobacco (*Nicotiana glauca*), and puncturevine (*Tribulus terrestris*). Perennial pepperweed is an abundant understory species found throughout Paradise Cut. Without adequate control measures, weedy species can be expected to rapidly colonize the restoration areas. The biology and control strategies for these species are described in the Paradise Cut Restoration Plan (Sycamore Environmental 2004).

5. *Wildlife*

Wildlife surveys of Paradise Cut and Stewart Tract were conducted for the West Lathrop Specific Plan EIR (Grunwald & Associates 1995) and numerous reconnaissance level and focused species surveys have been conducted in the study area in the years since. A list of wildlife species observed on Stewart Tract is in the Paradise Cut Restoration Plan (Sycamore Environmental 2004). Focused surveys have been conducted for several special-status species including California black rail, giant garter snake, San Joaquin kit fox, riparian (San Joaquin Valley) woodrat, and Western yellow-billed cuckoo (Grunwald & Associates 1995). None of these species have been observed in Paradise Cut.

In 2001, Dr. Dan Williams determined through trapping that RBR occurs in Paradise Cut and along the east and west sides of the Union Pacific Rail Road west ROW (UPRR; formerly Southern Pacific Rail Road) where it crosses Stewart Tract.

a) Existing RBR Habitat in Study Area

In the project area, RBR habitat consists of the vegetated outer perimeters of most islands in Paradise Cut. At some locations, the riparian vegetation consisting of trees and shrubs is dense (e.g., portions of RU 1), whereas in other areas the band of riparian vegetation is very narrow or absent (e.g., RU 4, RU 7). Existing RBR habitat is shown in Figure 3. To maximize the acreage of usable agricultural land, dirt farm roads are located around the outer margin of most islands. Where riparian vegetation is present, it is usually confined to a narrow band (10-50 ft) between the dirt road and the water's edge of each island.

The acreage of existing RBR habitat by location and ownership in Paradise Cut is shown in Table 2, which is summarized from Appendix A. River Islands owns or controls about 82% of Paradise Cut. A total of 190.14 acres of RBR habitat is present in Paradise Cut of which 138.69 acres are owned or controlled by River Islands. The locations where existing RBR habitat occurs in Paradise Cut are shown on Figure 3. Characteristics of existing RBR habitat in the study area are summarized in Table 3.

Table 2. Location and ownership of RBR habitat in Paradise Cut.

	Lower PC	Middle PC	Upper PC	Total in Paradise Cut
RBR habitat owned by River Islands	46.93	43.83	0.00	90.76
Habitat controlled* by River Islands	0.00	0.00	47.93	47.93
Total:	46.93	43.83	47.93	138.69
RBR habitat not owned or controlled by River Islands	8.10	12.54	30.81	51.45
Total:	55.03	56.37	78.74	190.14

* Controlled by options or other agreements.

Table 3. Characteristics of existing RBR habitat in study area.

Location of Habitat	Provide cover and forage?	Provide flood refugia?
In Paradise Cut, the perimeter around agricultural fields	Yes	No
In Paradise Cut, a ± 10 ft wide band at the toe of slope on the north and south Corps levees	Yes [a]	No [b]
In Upper Paradise Cut, in the area of level ground between the north or south levee	Yes	No
In the riparian vegetation around the 'pond' [c]	Yes	No
West UPRR ROW	Yes	Yes

[a] A narrow strip of vegetation ± 10 ft wide occurs at the base of the outboard slope (water side) of each levee. As required by the U.S. Army Corps of Engineers and the Reclamation Board for project levees, vegetation is frequently removed from this levee by mowing, discing, spraying, and burning.

[b] The levees have no vegetative cover above the area subject to inundation and thus do not provide cover for RBR during flood events.

[c] See Figure 3 for location. The pond is not affected by flooding in Paradise Cut.

b) Ownership of Existing RBR Habitat in Paradise Cut

The figure in Appendix B shows the ownership of parcels and levees in Paradise Cut and areas of RBR habitat. A brief summary of ownership follows:

- **Lower Paradise Cut:** The islands and north levee west of Paradise Road, but not the south levee, are owned by River Islands.
- **Central Paradise Cut:** All of the islands and the north levee, but not the south levee, are owned by River Islands. A strip of RBR habitat occurs adjacent to the south levee in RU 13 and RU 14. River Islands owns only the northern half of this habitat.
- **Upper Paradise Cut:** Between the West UPRR and I-5 (Figure 3, Sheet 3), River Islands does not own any of Paradise Cut or the levees. River Islands does not own any of the land in the 600 ft wide ROW of I-5. Between I-5 and the East UPRR ROW, River Islands controls, but does not own the north levee, the location of the Setback Levee, nor the south levee. Between the East UPRR and Paradise Weir, River Islands controls the channel bench area and the north levee, but not the south levee.

6. Soils

Soil types in Paradise Cut are described in the Paradise Cut Restoration Plan (Sycamore Environmental 2004).

7. Open Water and Flooding

The upper end of Paradise Cut begins at Paradise Weir, also called Paradise Dam. A rock weir separates Paradise Cut from the San Joaquin River. Water spills over the weir into Paradise Cut an average of once every four years when the water level in the San Joaquin River exceeds the height of the rock weir (i.e., when flow exceeds ± 18,000 cfs). The western portion of Paradise Cut is tidally influenced via connections with Old River.

Several channels in Paradise Cut contain open water year round whereas others are dry during summer and fall. In the summer, water levels in portions of Paradise Cut are influenced by the amount of water pumped in and out for agricultural irrigation. Water is also pumped from the San Joaquin River into Paradise Cut during the growing season. Water is then pumped out of the Cut to provide irrigation water for crops on Stewart Tract and farmland south of Paradise Cut.

Between 1979, when New Melones Dam was completed, and 1998, the flow in the San Joaquin River has exceeded 18,000 cfs 16 times (Table 4; pers. comm., Mike Archer 2002). During these time periods, water is assumed to have spilled over Paradise Weir and into Paradise Cut (pers. comm., Mike Archer). The data in Table 4 show that water flows into Paradise Cut 0 to 4 times per year, but the data do not infer a volume of water. It is very likely that subsurface water seeps into Paradise Cut from the river, even when water is not spilling over the top of the weir.

During the highest high flood events, water levels inundate all the agricultural fields in Paradise Cut. Only the top surfaces of the south and north Paradise Cut levees, and the tops of tall trees are exposed above water. Water has remained standing in Paradise Cut for up to a month after severe flooding (pers. comm., Skip Wilbur 2002).

Table 4. Periods when flow in the San Joaquin River has exceeded 18,000 cfs near Paradise Cut Weir.

Winter of:	Beginning Date	Ending Date
1980	20 January	5 February
	21 February	27 March
1982	8 April	19 May
1983	27 December 1982	5 January 1983
	25 January	21 July
	7 December	20 December
1984	28 December 1983	27 January
1986	23 February	1 March
	12 March	21 April

Winter of:	Beginning Date	Ending Date
1995	18 March	27 April
	4 May	8 June
1997	23 December 1996	8 March 1997
1998	5 February	14 March
	29 March	1 May
	16 May	3 June
	18 June	30 June

Source: Mike Archer, MBK Engineers.

8. *Zoning*

Paradise Cut is zoned Resources Conservation (RCO-ST). The zoning on Stewart Tract where the cross-levee would be constructed is Employment Center (EC-RI).

B. Regional Plans for Conservation and Enhancement of Biological Resources

Regional plans, programs, and guidance documents have been prepared by state and federal agencies that address the conservation of biological resources and habitat in San Joaquin County, including the area occupied by Paradise Cut. Examples of regional plans and programs that complement this RBR Plan and the Paradise Cut Restoration Plan (Sycamore Environmental 2004) are summarized below.

1. San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP)

The SJMSCP (2000) is a joint federal and state plan that provides a strategy for managing the effects of open space conversion on special-status species in San Joaquin County. Ninety-seven plant and animal species are treated in the SJMSCP.

The primary mechanism by which the plan operates is through development fees that are paid as compensation for conversion of land. The Joint Powers Authority (JPA) uses the fees to acquire and manage preserve lands that benefit special-status species. Upon payment of the development fee, a project proponent receives state and/or federal incidental take permits (ITP) for impacts on special-status species. River Islands may choose to participate in the SJMSCP to obtain permits for the development of Stewart Tract. Project proponents can dedicate land in lieu of paying fees.

The JPA uses developer fees to select, acquire, enhance, and manage preserves for the mitigation of impacts to special-status species. When acquiring riparian habitats, JPA preserves must consist of at least 10 acres (or 1000 lineal ft at a sufficient width to encompass the flood zone or existing riparian vegetation) of extant or restorable riparian forest along rivers, creeks, and streams.

Paradise Cut, which includes the currently unvegetated restoration areas, is designated as "Open Space/Conservation" land under the SJMSCP. The "Open Space/Conservation" designation includes existing undeveloped areas for plants and wildlife habitat, visual buffers, groundwater recharge, floodplain, and passive recreation activities. Establishing riparian vegetation in this area provides a habitat type that would satisfy the JPA's preserve acquisition requirements under the SJMSCP. Over 270 acres are available in areas identified by this Plan in which to create a riparian corridor, which is large enough to qualify as a SJMSCP riparian preserve.

The JPA is required to establish 25 acres of Valley elderberry longhorn beetle (VELB) mitigation site(s). Elderberry shrubs planted in the Levee Remnants Restoration Area and Setback Levee Restoration Area could potentially be used to fulfill this requirement. A VELB mitigation plan will be prepared for the River Islands project.

The SJMSCP discusses the effects of land conversion on RBR habitat, RBR habitat enhancement techniques on agricultural habitat lands, and preserve management plans that include conservation easements through fee title purchases.

2. *Coordination for Proposed SJMSCP Preserves*

The area in Paradise Cut addressed in this Plan could qualify as a preserve under the SJMSCP (2000). All or portions of Paradise Cut could be incorporated into the SJMSCP preserve system (SJMSCP 2000). To qualify as a preserve, coordination among appropriate agencies would need to be initiated. If River Islands and the JPA determine that all or a portion of the lands restored under this Plan would provide suitable SJMSCP preserve opportunities, River Islands will coordinate with the JPA, USFWS, and DFG as appropriate regarding the establishment of such preserves for SJMSCP purposes.

3. *Recovery Plan for Upland Species of the San Joaquin Valley, CA*

The Endangered Species Act of 1973, as amended, directs the Secretary of the Interior to develop and implement recovery plans for species of animals and plants listed as endangered or threatened. The Recovery Plan for Upland Species of the San Joaquin Valley, California (Recovery Plan; USFWS 1998) addresses the recovery or long-term conservation of 34 species of plants and animals. Establishing a network of conservation areas and preserves that represent all of the pertinent terrestrial and riparian natural communities is a central component of the Recovery Plan. The establishment of native communities in Paradise Cut will serve to partially fulfill the Recovery Plan goal by creating a wildlife preserve of over 750 acres.

One of the goals of the USFWS Recovery Plan is to establish three or more RBR populations, each with no less than 300 adults during average years (USFWS 1998). The RBR is expected to benefit from the creation of additional riparian habitat in Paradise Cut, which would provide additional habitat opportunities for the Paradise Cut RBR population.

One of the USFWS Recovery Plan goals for riparian woodrat is to establish three or more areas of occupied habitat each supporting 400 or more individuals, with a total population of 5,000 or more independent individuals (i.e., excluding dependent young) during average years (USFWS 1998).

4. *CALFED Bay-Delta Program*

CALFED is a cooperative, interagency effort involving 18 state and federal agencies with management and regulatory responsibilities in the Bay-Delta (CALFED 2000). Paradise Cut is located in the CALFED Delta Region Ecological Management Zone. In addition to improving water quality and water supply, one of the primary CALFED objectives is to "improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species" (CALFED 2000). Implementation of this Plan for Paradise Cut complements the

CALFED objective of increasing terrestrial habitats by creating native plant communities and providing habitats for species with specific CALFED goals.

The CALFED multi-species conservation strategy identifies conservation goals and evaluates 244 special-status species, including RBR, that could be affected in CALFED management zones.

C. Consultations to Date

Numerous meetings between state and federal agencies and River Islands have occurred over the last 3 years. A list of meetings and most of the attendees is presented below.

A meeting was held on 24 May 2001 at River Islands office. Among those present were Heather Bell and Karen Harvey, USFWS; Dan Williams, Ph.D., CSU Stanislaus; Waldo Holt, DFG; Susan Dell'Osso, River Islands; John Little, Ph.D., Sycamore Environmental.

A meeting was held on 16 April 2002 at the USFWS office in Sacramento, CA. Among those present were Adam Zerrenner, USFWS; Susan Jones, USFWS; Dan Gifford, DFG; Bruce Coleman, City of Lathrop; Susan Dell'Osso and Glenn Gebhardt, River Islands; Dan Williams, Ph.D., CSU Stanislaus; Clark Morrison, Morrison and Foerster; Sean Bechta, EDAW; and John Little, Ph.D., Sycamore Environmental.

A letter was sent from Ms. J. Knight at USFWS to Mrs. S. Dell'Osso, dated 11 June 2002. The subject was "Endangered Riparian Brush Rabbit, Threatened Giant Garter Snake, Threatened Valley Elderberry Longhorn Beetle, Threatened Delta Smelt, and Threatened Sacramento Splittail at Stewart Tract, and River Islands at Lathrop, San Joaquin County, California."

A meeting was held on 20 November 2002 at the USFWS office in Sacramento, CA concerning RBR trapping. Among those present were Cay Goude, USFWS; Adam Zerrenner, USFWS; Dan Williams, Ph.D., CSU Stanislaus; Laurissa Hamilton, ESRP; Susan Dell'Osso and Glenn Gebhardt, River Islands; Alicia Guerra, Morrison and Foerster; Sean Bechta, EDAW; and John Little, Ph.D., Sycamore Environmental.

A meeting was held 20 March 2003 at USFWS office in Sacramento, CA, regarding RBR trapping and breeding program. Among those present were Cay Goude, USFWS; Adam Zerrenner, USFWS; Dan Williams, Ph.D., CSU Stanislaus; Laurissa Hamilton, ESRP; Susan Dell'Osso, River Islands; Sean Bechta, EDAW; and John Little, Ph.D., Sycamore Environmental.

A meeting was held on 14 April 2003 at the USFWS office in Sacramento, CA. Among those present were Adam Zerrenner, USFWS; Harry McQuillen, USFWS; Don Hankins, USFWS; Susan Dell'Osso, River Islands; Sean Bechta, EDAW; and John Little, Ph.D., Sycamore Environmental.

A meeting was held on 15 May 2003 at the River Islands office in Lathrop and on-site. Among those present were Harry McQuillen, USFWS; Adam Zerrenner, USFWS; Kelly Hornaday, USFWS; Madelyn Martinez, NOAA Fisheries; Dan Gifford, DFG; Laurissa

Hamilton, ESRP; Susan Dell'Osso, Glenn Gebhardt, River Islands; Darryl Foreman, River Islands; Clark Morrison, Morrison and Foerster; Sean Bechta, EDAW; and John Little, Ph.D., Sycamore Environmental.

A meeting was held on 27 June 2003 at the River Islands office, Lathrop, and included a Zodiac boat survey around Stewart Tract and islands in Paradise Cut. Among those present were Adam Zerrenner, USFWS; Dan Gifford, DFG; Susan Dell'Osso and Glenn Gebhardt, River Islands; Darryl Foreman, River Islands; and John Little, Ph.D., Sycamore Environmental.

A meeting was held on 5 August 2003 at the USFWS office in Sacramento, CA. Among those present were Adam Zerrenner, USFWS; Susan Jones, USFWS; Dan Gifford, DFG; Susan Dell'Osso and Glenn Gebhardt, River Islands; Alicia Guerra, Morrison and Foerster; Sean Bechta, EDAW; and John Little, Ph.D., Sycamore Environmental.

D. Responsible Party

1. Present owner of the proposed Preserve Area

Rivers Islands at Lathrop
16976 S. Harlan Road
Lathrop, CA 95330
Contact: Ms. Susan Dell'Osso
209/ 858-2040

2. Preparer of Mitigation and Management Plan

R. John Little, Ph.D.
Sycamore Environmental Consultants, Inc.
6355 Riverside Blvd., Suite C
Sacramento, CA 95831
916/ 427-0703

3. Parties having financial responsibility for the attainment of the success criteria required by the proposed Mitigation and Management Plan

Rivers Islands at Lathrop
16976 S. Harlan Road
Lathrop, CA 95330
209/ 858-2040

4. Expected long-term owner of mitigation site and Parties responsible for long-term maintenance of mitigation area

River Islands proposes to create and actively restore approximately 112.57 acres of RBR habitat on Paradise Cut as described in Section V (Mitigation Area). In addition to the Mitigation Area, the RBR Plan also provides for the establishment of a Conservation Area.

River Islands proposes to coordinate with the San Joaquin Council of Governments (SJCOG) or the JPA regarding the long-term management and maintenance of the Mitigation Area and Conservation Area. Under this approach, SJCOG would manage both the Mitigation and the Conservation Areas on Paradise Cut in conjunction with its management of mitigation areas under the SJMSCP. The Conservation Area also would be available to SJCOG for purposes of restoration and creation of riparian habitat required under the SJMSCP. Under this arrangement, River Islands' payment of mitigation fees could be used by SJCOG to fund the long-term management and monitoring of the Mitigation Area.

Alternatively, the River Islands Geologic Hazards Abatement District (GHAD) may serve as the entity responsible for the management and monitoring of both the Mitigation and Conservation Areas. Fees sufficient to fund the long-term management and monitoring of the Mitigation Area will be collected from assessments collected to fund GHAD activities. No long-term management and monitoring is proposed for the Conservation Area.

E. Riparian Brush Rabbit

1. Regulatory Background

The RBR was state listed as endangered on 29 May 1994 (DFG 2004) and federal listed as endangered on 24 March 2000 (FR 65:8881-8890).

2. Critical Habitat

Critical habitat has not been designated for RBR. The USFWS determined that designating critical habitat for RBR was not prudent and would not provide additional benefit beyond that provided through its listing as endangered.

3. Recovery Plan

A conservation strategy for RBR is described in the "Recovery plan for upland species of the San Joaquin Valley, CA" (USFWS 1998). An important component for conservation of RBR is the establishment of other viable populations within its historical range. Establishment of a second population is important to prevent a single flood, wildfire, or other disaster from causing extinction of RBR (USFWS 1998).

The major problems with the existing potential habitat outside Caswell Memorial State Park are frequent flooding and lack of sufficient connected habitat (Williams and Basey cited in USFWS 1998). Areas outside Caswell Memorial State Park can become useable habitat for RBR by providing protection from flooding. Dikes or raised areas with cover to shelter from high water, cessation of wood cutting, and stopping the removal of logs and limbs, and curtailment of livestock grazing are needed along several stretches of the Stanislaus River downstream from Caswell Memorial State Park (USFWS 1999).

Further objectives of the conservation strategies in the Recovery plan include two needed actions (USFWS 1998):

- To establish an emergency plan and monitoring system to provide swift action to save individuals and habitat at Caswell Memorial State park in the event of flooding, wildfire, or a disease epidemic.
- To develop and implement a cooperative RBR conservation program that includes identifying and obtaining biological information needed in management decisions, establishing at least three additional wild populations in the San Joaquin Valley, a monitoring program of all RBR populations to assess populations trends and status, a long term reintroduction preplan for the prompt re-establishment of eliminated populations, and a cooperative program to take effect once the minimum of four protected populations are established.

4. Other USFWS Consultations that Relate to Project

Williams et al. (2002) and USFWS (2002) describe a captive breeding program for RBR. The purpose of the RBR breeding program is to provide new individuals for reintroduction to unoccupied parts of the historical range, as well as to augment existing populations, if needed. The breeding program uses individuals trapped from the South Delta population as breeding stock. Rabbits for this program have been trapped in Paradise Cut. The breeding enclosure is located near Lodi, CA. After captured RBR have spent a year in the breeding program, they are returned to the wild, but not necessarily to Paradise Cut. The first annual report on the breeding program was submitted in 2004 (Vincent-Williams et al. 2004).

F. Riparian Brush Rabbit: Species Account

1. Biology

The "Recovery plan for upland species of the San Joaquin Valley, CA" (USFWS 1998) provides a summary of the taxonomy, distribution, biology, and conservation of riparian brush rabbit. Compared to the relatively common desert cottontail (*Sylvilagus bachmani*) which also occur in the study area, RBR are generally smaller; their tails are inconspicuous; their ears are uniformly colored without black strips; and they are a darker, grayish brown color.

RBR are restricted to riparian forest habitats found in the floor of the San Joaquin Valley in the floodplain of the San Joaquin River and its tributaries from Stanislaus County to the Delta (Larsen 1993). RBR are strictly confined to areas with dense brushy and herbaceous groundcover within the riparian forest (Larsen 1993). They seldom venture more than 1 meter (3.3 ft) from cover and do not forage in large open areas (USFWS 1998). When pursued, RBR seek cover in shrubs instead of heading into open ground (USFWS 1998).

The breeding season of riparian brush rabbits occurs from January to May. Although males are capable of breeding all year long, females are only receptive from January to May (Larsen 1993).

RBR avoid large, open areas and thus seldom disperse beyond dense brush habitat (Williams 1988 cited in USFWS 1998). This character trait is cited as a reason why RBR have not dispersed out of Caswell Memorial State Park in San Joaquin County (USFWS 1998). Prior to their discovery in Paradise Cut by Dr. Dan Williams in 1998, Caswell Memorial State Park was the only known location of RBR for over 40 years.

RBR habitat includes large shrubs, small bushy trees, and large trees. Snags must be present, along with brushy areas that are at least 460 m^2 in size, and some high ground with appropriate cover for refuge during flooding (Larsen 1993). RBR live in 'tunnels' created in thickets of vines and shrubs of California wild rose (*Rosa californica*), wild grape (*Vitis californica*), and blackberries (*Rubus* spp.) (USFWS 1998).

Vegetation in close proximity to brushy cover, trails, and firebreaks are preferred foraging habitats for RBR (USFWS 1998). Their diet consists of herbaceous vegetation including grasses, sedges, clovers, shrubs, and forbs (Larsen 1993). Grasses and other herbs are the most important food for RBR. They also forage on leaves of shrubs such as California wild rose, marsh baccharis (*Baccharis douglasii*), and California blackberry (*Rubus ursinus*) (USFWS 1998). When available, green clover (*Trifolium wormskioldii*) is preferred over all other foods (USFWS 1998).

RBR are active throughout the year and follow a crepuscular activity pattern. Evening activity occurs between sunset and 2:00 am and morning activity occurs from 6:00 am until 10:30 am (Larsen 1993). In between active periods, they groom and rest in a small cleared area or in a downed log (Larsen 1993). RBR may bask in the sun during the afternoon. Ideal basking sites are typically no more than a few inches from cover and less than about 46 cm (18 in) above ground, with a partial, low overstory of small trees or vines for protection from aerial predators (Larsen 1993).

Predators include red-tailed hawk, Swainson's hawk, red-shouldered hawk, owls, feral cats, gray foxes, coyotes, and dogs (USFWS 1998). Black rats are known to prey on RBR (pers. comm. A. Zerrenner).

The conservation actions proposed in this Management Plan were based on the relatively low fecundity of RBR, their low mobility, susceptibility to their habitat being inundated during floods, lack of suitable habitat for foraging and cover, and lack of suitable flood refugia.

a) Existing threats

The primary threat to the survival of the RBR is the limited extent of its existing habitat (USFWS 1998). Riparian communities in the San Joaquin Valley have been reduced to less than 1% of their historical extent, primarily by clearing of natural vegetation, irrigated cultivation, impoundment of rivers, and stream channelization (USFWS 1998, cited in Williams and Hamilton 2002). A key factor appears to be a lack of dry areas during prolonged storms and a lack of densely vegetated high ground that provides protection from predators and high water during flooding (Williams and Basey 1986; Williams et al. 2000; and ESRP unpublished data, cited in Williams and Hamilton 2002).

b) Fragmentation of habitat

The loss of riparian forest and conversion of floodplains to vineyards, orchards, and row crops, coupled with the construction of levees in the San Joaquin Valley, has eliminated habitat for riparian brush rabbit (USFWS 1998). Connectivity between remaining suitable habitats has been reduced or eliminated.

c) Population trends

Currently, riparian brush rabbits are known to occur at 1) Caswell Memorial State Park on the Stanislaus River; 2) Paradise Cut between the San Joaquin River and Old River; 3) Tom Paine Slough south of Stewart Tract; 4) in the West UPRR ROW that crosses Stewart Tract, Paradise Cut and Tom Paine Slough (Williams and Hamilton 2002); 5) in the "oxbow" at Mossdale, on the east side of the San Joaquin River north of Stewart Tract; and 6) at five locations on the east side of the San Joaquin River (west bank of east levee), 3-4 miles north of the oxbow (Vincent-Williams et al. 2004). Paradise Cut and Tom Paine Slough are overflow channels of the San Joaquin River at the edge of the San Joaquin River Delta (Williams and Hamilton 2002). After the 1998 RBR recovery plan was released, RBR were discovered in Paradise Cut, Tom Pain Slough, in the West UPRR ROW, and the "oxbow" at Mossdale.

Williams and Hamilton (2002) reported trapping 21 RBR in Paradise Cut and observing many others during a survey in August 2001. They also reported that people who lived or worked near Paradise Cut for many decades had never seen as many rabbits as in August 2001. Based on their survey, they believe the RBR population in Paradise Cut was several hundred individuals. They also believe the population was at a peak, because there had not been a flood in Paradise Cut since the winter of 1997-98. The results of their survey suggested that more RBR were present closer to the UPRR railroad.

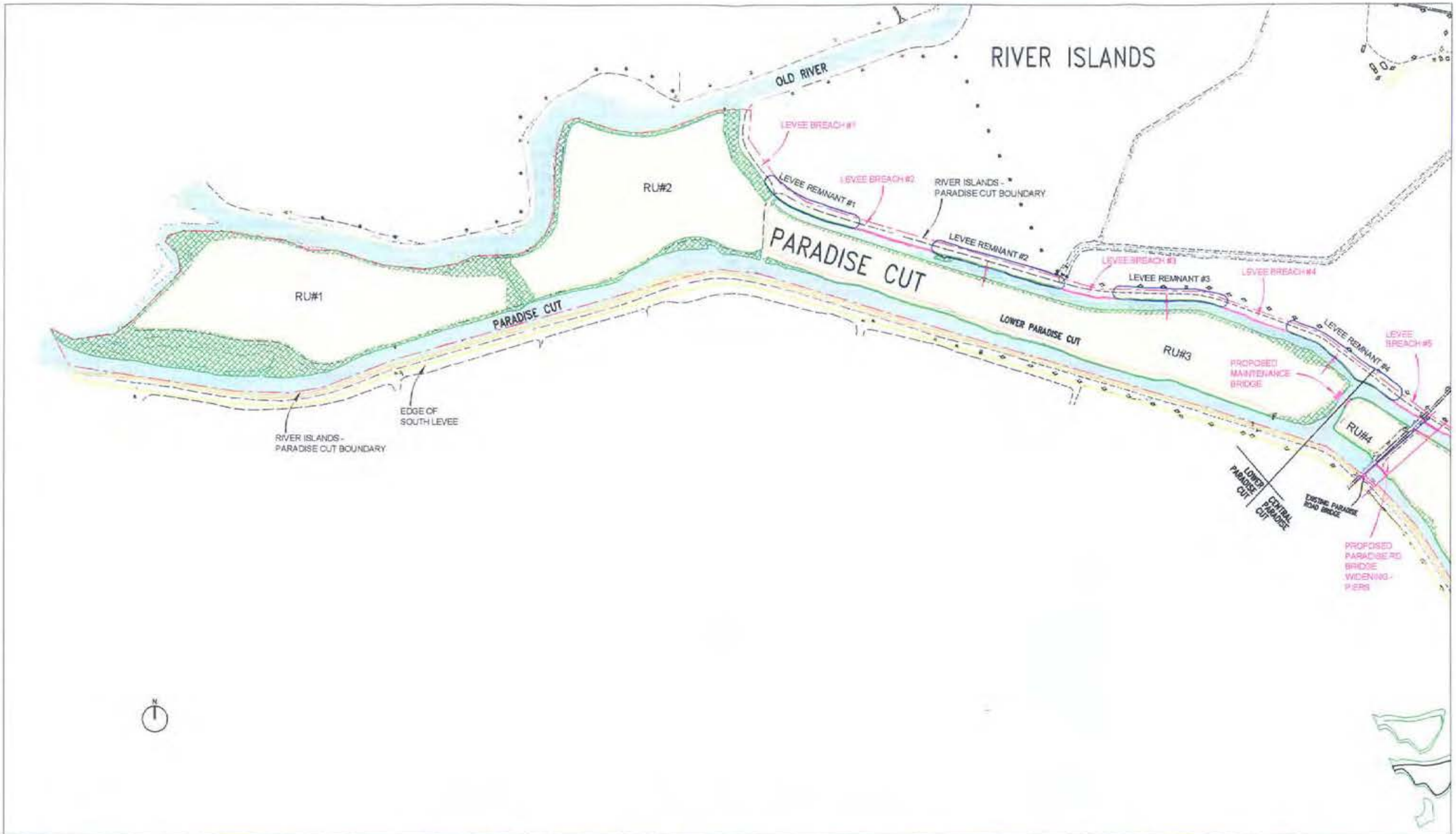
d) Trap stress and mortality

Based on the results of the trapping conducted in Paradise Cut by Williams and Hamilton (2002), riparian brush rabbits appear tolerant to being trapped.

2. *Survey Information*

Prior to 1998, RBR were known only from Caswell Memorial State Park. In 1998, Dr. Williams trapped RBR in the area along the East UPRR ROW in Paradise Cut. He conducted fieldwork periodically in 1998 and 1999 to obtain tissue samples for genetic analysis and to determine the distribution of brush rabbits in the area.

In the summer of 2001, Dr. Williams obtained permission from River Islands to conduct a survey of Paradise Cut for RBR and its habitat. The objectives of the survey were 1) to determine if RBR were present along Paradise Cut north of the UPRR; 2) collect tissue samples for use in genetic studies; 3) determine the extent of RBR distribution, and 4) estimate the amount of potential and occupied habitat. The survey was conducted as part of the Endangered Species Recovery Program, Department of Biological Sciences, California State University, Stanislaus (Williams and Hamilton 2002).



Riparian Brush Rabbit
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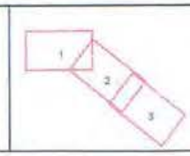
Figure 3. Paradise Cut
Existing RBR Habitat and Impacts

= Existing Agriculture
= Existing RBR Habitat
= Existing RBR Habitat (Offsite)

= Permanent Impact to RBR Habitat
= Temporary Impact to RBR Habitat
= Levee Remnant
= Land Bridge (Max. Elevation 10')
= RR Flatcar Bridge



900' 450' 0 900'
SCALE: 1" = 900'

SHEET:
1 of 3

Sycamore Environmental Consultants, Inc.

Source:
Aerial Photomapping Services,
5 ft Topo Contour Map, 1993 ed.; Carlson,
Barbee & Gibson MSTR.dwg, June 2003 ed.

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SHEET:
2 of 3

Sycamore Environmental Consultants, Inc.

Source:
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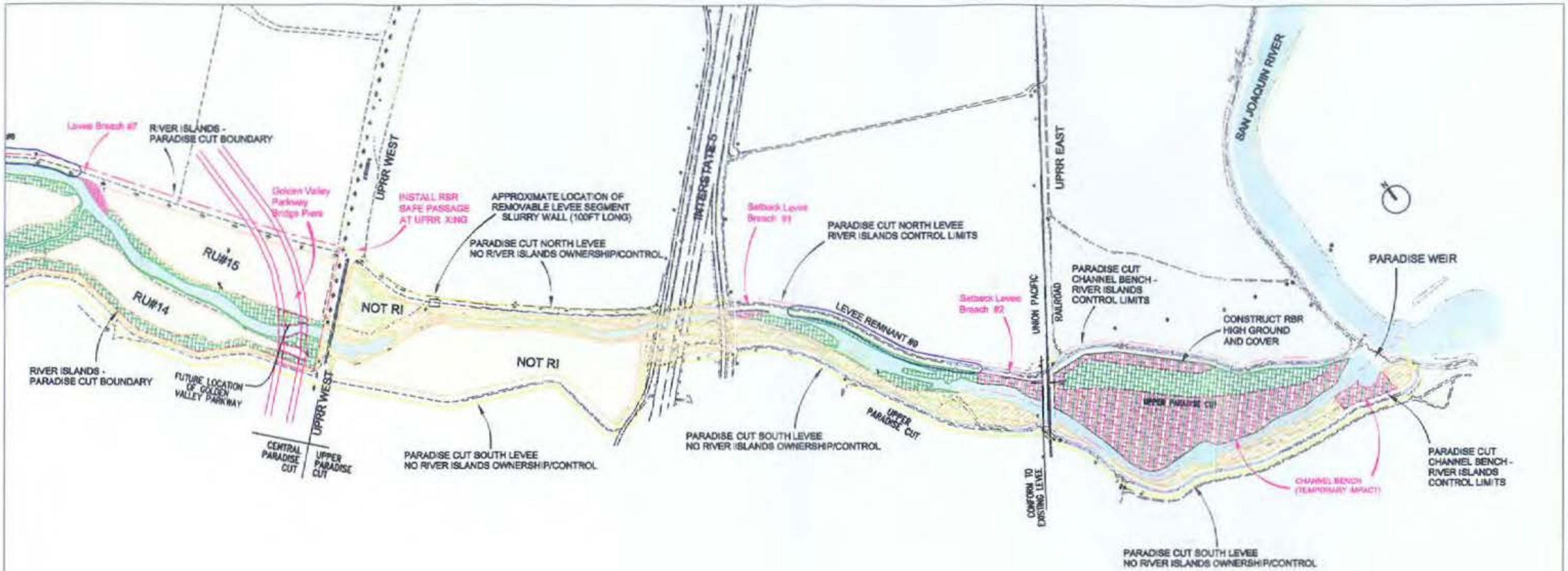

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III. PROJECT EFFECTS ON RIPARIAN BRUSH RABBIT

A. Timing of Project Effects

Construction of the River Islands at Lathrop Project will in three phases occur over a 20-year period:

- Phase 1a. Project Initiation to Year ± 3
- Phase 1. ± Year 4 through Year ± 10 (2015)
- Phase 2. ± Year 11 through completion at Year ± 20 (2025)

Most direct impacts that would affect RBR habitat will occur in the first 10 years. Direct (permanent and temporary) and indirect impacts to RBR will occur during construction of the project. Table 5 summarizes the type of impact, specifies whether it is permanent or temporary, and provides a brief description of the impact. Each impact is numbered and corresponds with the text.

B. Direct and Indirect Effects

The Endangered Species Act defines direct effects as an effect caused by a proposed action that occurs at the same time as the proposed action. In this document, "direct effects" are those actions that are expected to result in the permanent or temporary loss of RBR habitat. A permanent loss is assumed to occur if the habitat cannot be restored at that location, e.g., the locations where the north Paradise Cut levee is breached. A temporary loss is assumed if the habitat will be restored.

"Potential direct effects" are actions that could affect RBR habitat, for example, during construction of new water, wastewater, and recycled water lines (Impacts 1a.4 and 1.7) could result in temporary impacts. However, at the present time it is unknown if RBR habitat would be affected or not. This document assumes that these actions would affect RBR habitat and the estimated acres are included in the Table 5.

Table 5 lists the type and acreage of direct and indirect effects to RBR habitat that would occur during each of the three phases. Indirect effects that would also occur in Phases 1 and 2 are noted in Table 5.

Table 5. Summary of direct effects (temporary and permanent) and indirect effects to riparian brush rabbit habitat.

Phase 1a (Project initiation to year ± 3)

Permanent	Acre	Temporary	Acre	Impact #	Impact Description
		Temporary	1.00	1a.1	Improvements and modifications to Stewart Road, at-grade crossing (estimated ac).
		Temporary	0.003	1a.2	Temporary construction truck traffic at UPRR crossing on north Paradise Cut levee.
		Temporary	0.20	1a.3	Develop recycled water storage and disposal areas, as needed, in Phase 2 area and Paradise Cut (estimated ac).
		Temporary	0.20	1a.4	Potential direct effects: Construct new water, wastewater, and recycled water lines in UPRR ROW (estimated ac).
	0.00		1.40		Totals for Phase 1a.

Phase 1 (Year ± 4 through ± Year 10)

Permanent	Acre	Temporary	Acre	Impact #	Impact Description
Permanent	1.05			1.1	Create 7 breaches on the north Paradise Cut levee.
Permanent	0.02			1.2	Construct a removable segment on the north Paradise Cut levee east of UPRR ROW.
Permanent	0.01	Temporary	1.86	1.3	Construct Golden Valley Parkway Bridge in Paradise Cut; install bridge piers.
		Temporary	3.84	1.4	Create 3 land bridges between 4 levee remnants.
		Temporary	0.09	1.5	Setback Levee: Two new breaches on the north Paradise Cut levee between eastern UPRR tracks and I-5.
		Temporary	29.13	1.6	Lower bench west of Paradise Weir (26.08 ac n&s side Paradise Cut lowered 4-5 ft; + 3.05 ac disturbed by haul route)
		Temporary	0.10	1.7	Potential direct effects: Construct new water, wastewater, and recycled water lines (estimated ac)
				1.8	Potential direct effects to RBR: Construct cross-levee.
				1.9	**Indirect effects:**
					Occupation of newly constructed residential units and other facilities on high ground.
Permanent	0.84			2.00	Loss of habitat around pond on Stewart Tract.
	1.92		35.02		Totals for Phase 1.

Phase 2 (Year 11 through completion at ± Year 20)

Permanent	Acre	Temporary	Acre	Impact #	Impact Description
Permanent	0.01	Temporary	0.17	2.1	Construct Paradise Road Bridge over Paradise Cut; bridge piers.
				2.2	**Indirect effects:**
					Occupation of completed developments at West Village, Lakeside, and Woodlands Districts.
					Occupation of completed Employment Center, infrastructure, residences, other buildings.
					Conduct maintenance dredging of Paradise Cut canal when/where needed. Potential indirect effects to RBR.
	0.01		0.17		Totals for Phase 2.

1.93		**Total Permanent Impact (acres)**
	36.59	**Total Temporary Impact (acres)**

Note: Direct effects occur from both permanent and temporary impacts.

C. Program Level Avoidance and Minimization Measures

Most of the direct impacts to RBR habitat are temporary. Avoidance and minimization measures will be implemented to protect habitat and prevent the take of individual RBR during construction. Most of the activities will be completed in one or two years. Construction disturbance in Paradise Cut due to these activities will occur infrequently over a period of 10 years in Phases 1a and 1.

Three program level avoidance and minimization measures will be implemented for all earthmoving and other construction activities in Paradise Cut and adjacent to the UPRR ROW. These include:

- Clear and Grub
- Establish an ESA, and
- Conduct a Worker Education Program.

Clear and Grub involves the following activities:

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.

Establishing an ESA involves the following activities:

- An ESA will be established at the boundary of the construction zone. The ESA will delimit the area accessible to construction personnel and vehicles. A silt fence or other suitable temporary barrier will be installed prior to construction to prevent RBR from entering the construction zone.
- The construction contractor will be responsible for installing the silt fence after consulting with the biological monitor.
- The construction contractor will be responsible for maintaining a fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected at least once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- The fence will be removed after construction has been completed.
- If UPRR will not allow installation of a temporary fence in their ROW as proposed, a biological monitor will be on-site whenever construction activities occur in RBR habitat.

The Worker Education Program avoidance and minimization measure will typically require the following for each construction activity:

- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program to be presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.

1. Phase 1a. Project Initiation to Year 3. Direct Effects.

During Phase 1a, four project actions will directly affect RBR habitat: 1) Improvements and modifications to Stewart Road at the UPRR at-grade crossing; 2) Construction truck traffic at UPRR crossing on north Paradise Cut levee road; 3) Construction of new water, wastewater, and recycled water lines; and 4) Development of recycled water storage and disposal areas, as needed, in Phase 2 area and Paradise Cut. During Phase 1a, approximately 1.40 acres of RBR habitat would be temporarily affected (Table 5).

Although construction of 800 residential units would begin in Phase 1a, no direct or indirect effects would occur to RBR. The indirect effects to RBR attributable to construction of residential units are discussed in Section III.C.4.

For each impact, the following items are discussed: a) the activity causing the impact; b) the potential for impact on RBR or its habitat; and c) the site-specific avoidance and/or mitigation measures that would be implemented to avoid or reduce the intensity of impact to less than significant.

a) Impact 1a.1. Improve/modify Stewart Road and improvements to the at-grade crossing. Direct effect.

Discussion: Stewart Road, a narrow, two-lane public road, crosses the West UPRR ROW at-grade (Figure 4). To support the level of service required by the project, the road will be widened and standard railroad safety features installed. RBR habitat at this location occurs in the UPRR ROW. Revegetation of disturbed areas in the UPRR ROW is not proposed. Railroads maintain and periodically remove vegetation to avoid fire damage. Vegetation in a railroad ROW is subject to being chemically controlled or mechanically removed at any time by UPRR.

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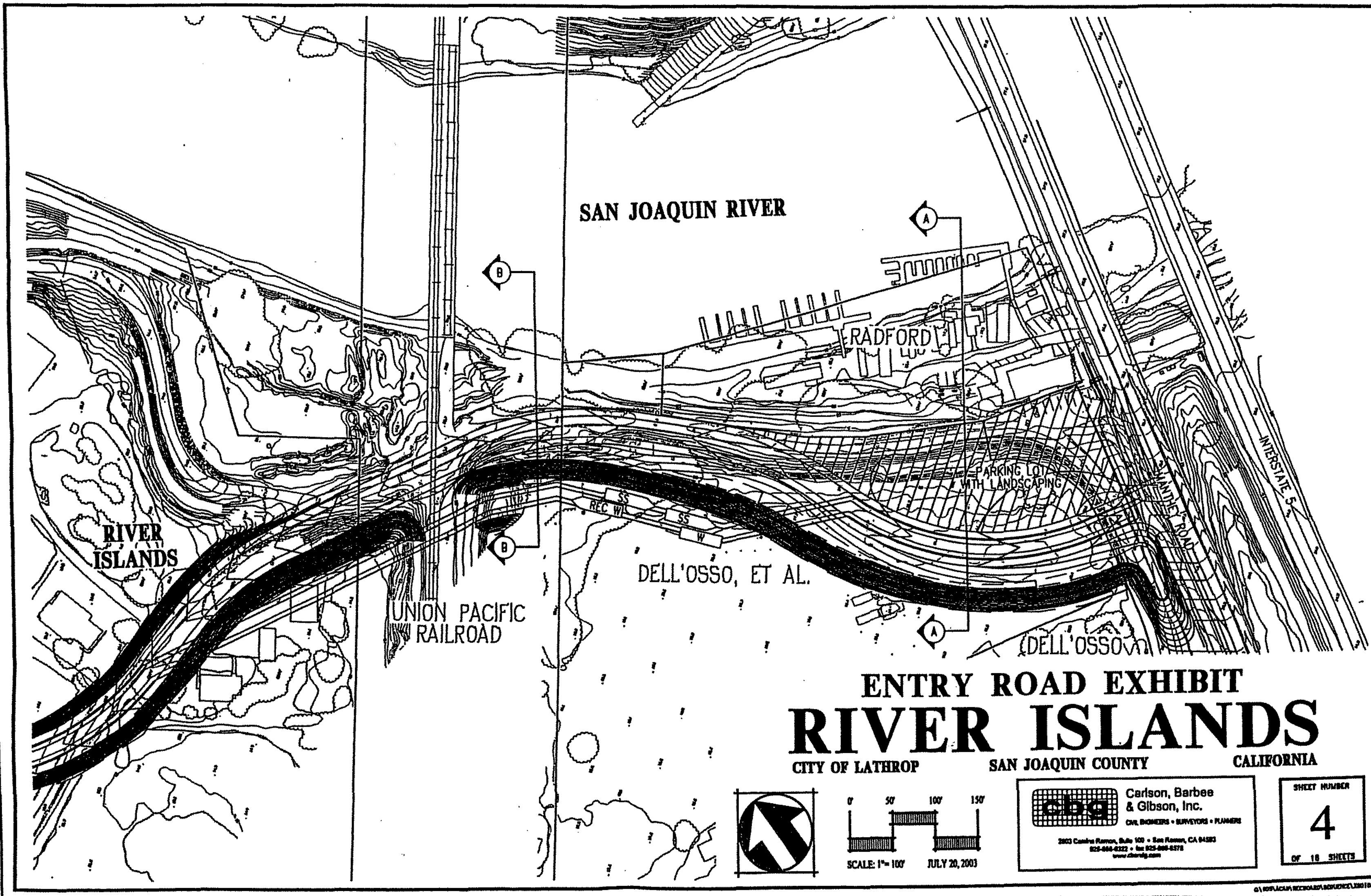
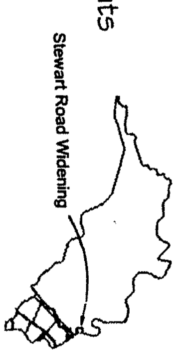


Figure 4. Stewart Road - UPRR At-Grade Improvements



Sycamore Environmental Consultants, Inc.

Source:
Carlson, Barbee & Gibson,
Entry Road Exhibit-Sheet 4, July 2003

Potential for Impact: RBR are known to occur in the West UPRR ROW on Stewart Tract. The at-grade modifications to Stewart Road will result in a temporary loss of forage and/or foraging potential of 1.00 acre (estimated). During construction, individual RBR could be directly affected.

Avoidance/ Minimization Measures: To avoid and minimize take of RBR during construction of the Stewart Road improvements, the following measures will be implemented:

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program to be presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.
- An ESA will be established at the southern boundary of the construction zone. The ESA will delimit the area accessible to construction personnel and vehicles. A silt fence or other suitable temporary barrier will be installed prior to construction to prevent RBR from entering the construction zone.
- The construction contractor will be responsible for installing the fence after consulting with the biological monitor.
- The construction contractor will be responsible for maintaining the fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- The silt fence will be removed after construction vehicles no longer use the levee road.
- If UPRR will not allow installation of a temporary fence in their ROW as proposed, a biological monitor will be on-site whenever construction activities occur in RBR habitat.

b) Impact 1a.2. Temporary construction truck traffic at UPRR crossing on north Paradise Cut levee. Direct effect.

Discussion: The private dirt road on top of the north Paradise Cut levee crosses the UPRR at-grade (Figure 5). Construction on Stewart Tract will be facilitated if earthmoving trucks and other construction vehicles access the island from this crossing (pers. comm., G. Gebhardt). The narrow levee road at this crossing will be widened to improve traffic flow and safety during construction.

Potential for Impact: RBR are known to occur in the UPRR ROW on Stewart Tract. There is no culvert under the north Paradise Cut levee road through which RBR can pass. RBR could cross the road during the day when vehicles are driving across the unvegetated levee. The potential effect on RBR at this location is disruption of 0.003 acre of dispersal corridor. During a site visit on 15 May 2003, Mr. Adam Zerrenner, USFWS, expressed concern that increased truck traffic on the levee road could disrupt RBR movement across the road. Direct mortality is unlikely because truck traffic would normally occur during the day, when RBR are unlikely to disperse. A solution to avoid or minimize the effects of truck traffic to RBR was developed by River Islands in coordination with USFWS and Ms. Laurissa Hamilton. Ms. Hamilton said that a 6-inch diameter pipe would be large enough for RBR to pass through.

Avoidance/ Minimization Measures: To avoid and minimize take of RBR from construction traffic at this location in the UPRR ROW, the following measures will be implemented:

- To provide a passage for RBR across the levee road, four, 6-inch diameter pipes, 20-25 ft long, will be installed perpendicular to the levee road (Figure 5). These will allow RBR to cross the levee road. The pipes will be steel to support the weight of trucks and secured in concrete (pers. comm., G. Gebhardt).
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act. (Personnel who have received the training within the previous 12 months do not need to attend.)
- To help funnel RBR into the vicinity of the pipes at the levee road crossing, a temporary fence will be installed on the south and north sides of the levee. The purpose of this fence is to direct RBR toward the steel pipes to help prevent them from accessing the levee road.

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Figure 5.
Passage Design for Paradise Cut Levee Road at UPRR West Crossing

20' 10' 0 20'

SCALE: 1"= 20'

Paradise Cut Levee Road at UPRR West Crossing

Sycamore Environmental Consultants, Inc.

Source:
Aerial Photomapping Services,
1 ft Topo Contour Map, 1998 ed.; Carlson, Barbee & Gibson MSTR.dwg, June 2003 ed.

- The construction contractor will be responsible for installing a fence after consulting with the biological monitor. Fences would be installed on the north and south sides of the levee to funnel RBR toward the pipes.
- The construction contractor will be responsible for maintaining the fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the fence will be inspected once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- If UPRR will not allow a temporary fence to be placed in their ROW as proposed, USFWS will be contacted to discuss an alternate avoidance strategy.

c) Impact 1a.3. Develop recycled water storage and disposal areas, as needed, in Phase 2 area and Paradise Cut. Direct effect.

Discussion: Tertiary treated wastewater will be discharged on agricultural land in Paradise Cut during summer months. The water could be used to irrigate agricultural crops and/or could be used as a source of water for created wetlands. A water disposal line would be constructed in Paradise Cut, which will involve trenching a ditch from the south to the north end of Paradise Cut. The alignment of the pipeline has not been determined.

Potential for Impact: RBR occur at various locations in Paradise Cut, primarily in riparian vegetation around the perimeter of the islands. RBR are assumed to be present wherever suitable habitat occurs. It is assumed that trenching to install a pipeline would temporarily affect RBR cover and foraging habitat. An estimated 0.20 acre of RBR habitat would be temporarily removed where the water line would be trenched.

Avoidance/ Minimization Measures: To avoid and minimize take of RBR during installation of recycled water pipeline in Paradise Cut, the following measures will be implemented:

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.

- An ESA will be established at the boundaries of the construction zone. The ESA will delimit the area accessible to construction personnel and vehicles. A silt fence or other suitable temporary barrier will be installed prior to construction to prevent RBR from entering the construction zone.
- The construction contractor will be responsible for installing a fence after consulting with the biological monitor.
- The construction contractor will be responsible for maintaining the fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- The construction contractor will remove the fence after construction is completed.
- Disturbed areas will be revegetated with appropriate native species as described in the Paradise Cut Restoration Plan.

d) Impact 1a.4. Construct new water, wastewater, and recycled water lines across UPRR ROW. Potential direct effect.

Discussion: Three new water lines to service the development on Stewart Tract will be installed south of the UPRR at-grade crossing on Stewart Road. The location of these water lines has not been determined, but they would most likely be installed several hundred feet south of the existing crossing. The lines would be installed under the UPRR berm by "pushing" or by jack-and-bore technique (pers. comm., G. Gebhardt). Revegetation of disturbed areas in the UPRR ROW is not proposed. Railroads maintain and periodically remove vegetation to avoid fire damage. Vegetation in a railroad ROW is subject to being chemically controlled or mechanically removed at any time by UPRR.

Potential for Impact: RBR occur in the UPRR ROW on Stewart Tract. RBR habitat could be temporarily disturbed in the UPRR ROW during set-up and operation of the equipment needed to install the water lines under the railroad berm. An estimated 0.20 acre of RBR habitat could be temporarily removed in the UPRR ROW during construction.

Avoidance/ Minimization Measures: To avoid and minimize take of RBR during installation of new water lines under the UPRR berm, the following measures will be implemented:

- To the extent possible, RBR habitat in the UPRR ROW will be avoided. Avoidance will be achieved if construction activities take place outside the ROW. However, if engineering constraints require encroachment into areas of RBR habitat in the UPRR ROW, the following measures will be implemented:
- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR. If RBR are observed, vegetation clearing will cease until the

rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.

- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.
- An ESA will be established at the southern boundary of the construction zone. The ESA will delimit the area accessible to construction personnel and vehicles. A silt fence or other suitable temporary barrier will be installed prior to construction to prevent RBR from entering the construction zone.
- The construction contractor will be responsible for installing a fence after consulting with the biological monitor.
- The construction contractor will be responsible for maintaining the fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected at least once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- The construction contractor will remove the fence after construction is completed.
- If UPRR will not allow installation of a temporary fence in their ROW as proposed, a biological monitor will be on-site whenever construction activities occur in RBR habitat.

2. Phase 1. Year 4 through Year 10 (2015). Direct Effects.

During Phase 1, four actions would permanently remove 1.92 acres of existing RBR habitat (Table 5): 1) Creation of seven breaches on the north Paradise Cut levee; 2) Installation of a removable levee segment on the north Paradise Cut levee; 3) Installation of bridge piers in Paradise Cut for Golden Valley Parkway Bridge; and 4) Filling of the pond on Stewart Tract. Construction of the cross-levee on Stewart Tract could potentially affect individual RBR due to the proximity of construction activities to known RBR habitat in the West UPRR ROW.

During Phase 1, five actions would result in a temporary loss of 35.02 acres RBR forage habitat and/or foraging potential (Table 5): 1) Temporary impacts in Paradise cut to construct Golden Valley Parkway; 2) Creating 3 land bridges between 4 levee segments; 3) Setback Levee: two new breaches on the north Paradise Cut levee between eastern UPRR tracks and I-5; 4) Lowering the bench 4-5 ft west of Paradise Weir; and 5) Constructing new water, wastewater, and recycled water lines. The impact of creating the two breaches for the setback levee will be temporary because these areas will be revegetated and will only be inundated when water flows into Paradise Cut.

a) Impact 1.1. Create 7 breaches on the north Paradise Cut levee to create islands from levee remnants. Permanent direct and effects.

Discussion: A new channel will be created on Stewart Tract north of and parallel to the existing Paradise Cut north levee (Figure 7, Sheet 1). The new channel will increase the hydraulic capacity of Paradise Cut.

The existing north levee would be breached at seven locations resulting in eight levee remnants. The eight levee remnants will remain above water during floods and will provide flood refuge for RBR and other wildlife species. The purpose of the breaches is to improve water flow between Paradise Cut and the new channel. The existing north levee would be removed and excavated to an elevation of approximately -5 ft. At three locations, the levee would only be partially removed to form a land bridge (see Impact 1.4).

Potential for Impact: A narrow strip of vegetation ± 10 ft wide occurs at the base of the outboard slope (water side) of each levee. Approximately 1.05 acres of RBR habitat would be permanently removed when the seven levee breaches are created. Where habitat is present, individual RBR could potentially be injured or killed during construction.

During a meeting on 15 May 2003, Mr. Harry McQuillen, Chief of the Endangered Species Branch, USFWS, expressed concern over the potential for isolation of RBR individuals if trapped on the levee remnants during a flood in Paradise Cut. This scenario could occur if a levee remnant was permanently surrounded by water (thus, resulting in an indirect effect to RBR). To address this concern, River Islands evaluated the feasibility of leaving segments of the levee, i.e., land bridges, between three levee remnants. Based on hydraulic analyses, project engineers determined that land bridges would allow for sufficient hydraulic mixing while simultaneously providing a corridor for RBR to move between remnants after water levels recede.

Avoidance/ Minimization/ Restoration Measures: To avoid and minimize take of RBR during construction of the seven breaches, the following measures will be implemented:

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR by the biological monitor. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the

status of the species, and the legal protection afforded under the Endangered Species Act.

- To the extent possible, earthmoving equipment will not encroach beyond the toe of slope into Paradise Cut on the south side of the existing levee. Earth removal activities on the landside of the levee will minimize potential direct and indirect impacts to RBR.
- Four types of connections will allow RBR movement between the levee remnants and the islands in Paradise Cut: land bridges, railroad flatcar bridges, an existing vehicular bridge, and an existing dirt farm road.

b) Impact 1.2. Construct removable segment on north Paradise Cut levee. Permanent direct effect.

Discussion: A 100 ft long, removable segment (weir) will be installed on the north Paradise Cut levee east of the West UPRR ROW (Figure 3). This segment would be removed (opened) if floodwaters become impounded behind the UPRR ROW.

Potential for Impact: A narrow strip of vegetation ± 10 ft wide occurs at the base of the outboard slope (water side) of each levee. Approximately 0.02 acre of RBR habitat would be permanently removed when the removable segment is constructed. Where habitat is present, individual RBR could potentially be injured or killed during construction.

Avoidance/ Minimization/ Restoration Measures: See Impact 1.1.

c) Impact 1.3. Construct Golden Valley Parkway Bridge. Permanent direct and temporary effects.

Discussion: During Phase 1, the Golden Valley Parkway Bridge will be constructed across Paradise Cut (Figure 7). Piers need to be installed in Paradise Cut to support the new bridge.

Potential for Impact: Approximately 0.01 acre of RBR habitat would be permanently removed when the bridge piers are installed in Paradise Cut. In addition, about 1.86 acre would be temporarily removed during construction of the bridge. RBR could be directly affected when the breaches are created.

Avoidance/ Minimization/ Restoration Measures: To avoid, minimize, and mitigate for take of RBR during installation of the bridge piers, the following measures will be implemented:

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR by the biological monitor. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.

- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.
- An ESA will be established at the southern boundary of the construction zone. The ESA will delimit the area accessible to construction personnel and vehicles. A silt fence or other suitable temporary barrier will be installed prior to construction to prevent RBR from entering the construction zone.
- The construction contractor will be responsible for installing a fence after consulting with the biological monitor.
- Temporary signage will be placed at 150 ft intervals along the boundary of the fence warning construction personnel to stay out.
- The construction contractor will be responsible for maintaining a fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- The construction contractor will remove the fence after construction is completed.
- Disturbed areas will be revegetated with appropriate native species as described in the Paradise Cut Restoration Plan.

d) Impact 1.4. Construct 3 land bridges. Temporary direct effect.

Discussion: Three land bridges will be established between Levee Remnants 5 and 6, 6 and 7, and 7 and 8. A land bridge is a levee segment that is partially breached. By maintaining connectivity, terrestrial wildlife, including RBR, can move between the adjacent levee remnants. The upper surface of the land bridges will be at ± 10 ft elevation. The land bridges will be vegetated to create new forage habitat for RBR as described in the Paradise Cut Restoration Plan. During flood events water will flow over the land bridges into Paradise Cut. After floodwaters recede, the land bridges will provide connectivity between the adjacent remnants.

Potential for Impact: The unvegetated, upper portion of the existing levee that would be removed to form a land bridge does not provide habitat for RBR. However, a narrow strip of vegetation on the waterside of the north levee provides marginal RBR habitat. About 3.84 acre would be temporarily removed when the land bridges are constructed. Habitat impacts would be temporary because these areas will be revegetated and would only be inundated when water flows into Paradise Cut.

Avoidance/ Minimization/ Restoration Measures: See Impact 1.1.

e) Impact 1.5. Setback Levee: Make two breaches on the north Paradise Cut levee between east UPRR ROW and I-5. Temporary direct effect.

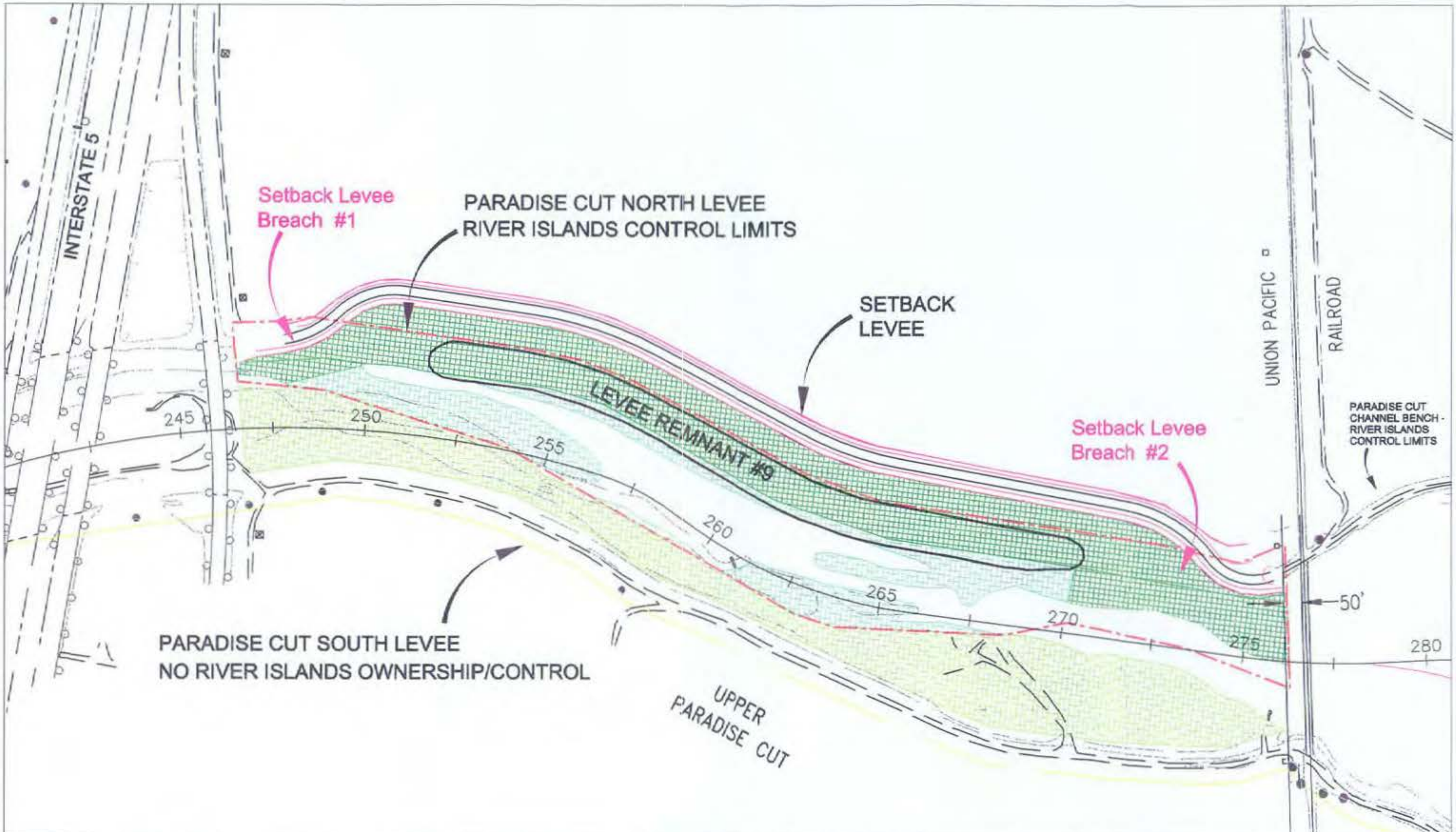
Discussion: Widening Upper Paradise Cut will increase its capacity and thereby help reduce the potential for flooding. The Setback Levee will first be constructed ± 150 ft north of the existing levee. After this is completed, two, 200 ft long breaches will be removed from the existing levee, one at the downstream end and one at the upstream end (Figure 6). A levee remnant (LR 9) will remain opposite the Setback Levee.

The initial engineering design (Carlson, Barbee & Gibson 2002) contemplated the removal of the entire existing levee and reuse of the soil to construct the Setback Levee. To minimize impacts on RBR, the applicant evaluated whether a portion of the levee could remain in place to provide additional high ground for RBR. Project engineers and hydrologists evaluated different scenarios and determined that a portion of the levee could be left in place because the Setback Levee will need to be constructed before the existing levee is breached. However, for the remnant to be left in place and achieve the same hydraulic conditions, it will be necessary to excavate more soil between the existing and new levee and/or, move the proposed Setback Levee farther north. River Islands is proposing to modify the levee design in order to preserve a portion of the existing levee.

Potential for Impact (from creation of two breaches): Construction of the new Setback Levee will not affect RBR habitat because it will be located in an area currently farmed. However, a portion of the south bank (waterside) of the existing levee provides suitable RBR habitat. Constructing the two breaches will temporarily remove 0.09 acre of RBR habitat. RBR could be directly affected when the breaches are created. The breach locations would be inundated only during flood events when water spills over the Paradise Weir from the San Joaquin River. The impact will be temporary because these areas will be revegetated and will only be inundated when water flows into Paradise Cut. The north side and top of the existing levee are currently denuded and do not provide RBR habitat.

Avoidance/ Minimization/ Restoration Measures: To avoid and minimize take of RBR during removal of the two breaches from the existing levee, the following measures will be implemented:

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.



Riparian Brush Rabbit
Mitigation and Management Plan
River Islands at Lathrop
28 April 2004

Figure 6.
Setback Levee and Remnant Levee #9

= NEW RBR Habitat
= Levee Remnant
= Existing RBR Habitat
= Existing RBR Habitat (Offsite)

250' 125' 0 250'
SCALE: 1" = 250'
SHEET: 1 of 1

Sycamore Environmental Consultants, Inc.

Source: Aerial Photomapping Services, 5 ft Topo Contour Map, 1993 ed.; Carlson, Barbee & Gibson MSTR.dwg, June 2003 ed.

- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.
- To the extent possible, earth-moving equipment will not encroach into Paradise Cut beyond the toe of slope on the south side of the existing levee. Concentrating the earth removal activities on the landside of the levee will minimize potential direct and indirect impacts to RBR.
- Disturbed areas in the breach will be revegetated with appropriate native species as described in the Paradise Cut Restoration Plan.

f) Impact 1.6. Lower the "bench" west of Paradise Weir; soil to be used to reinforce south Paradise Cut levee. Temporary direct effect.

Discussion: A 38.8-acre level area just west of Paradise Weir is called the "bench" (Figure 7, Sheet 3), a portion occurs on both the north and south sides of the channel. The bench has been created through the incremental deposition of sediment (primarily sand) when water in the San Joaquin River spills over the weir and flows into Paradise Cut. The volume of soil occupied by the bench reduces the hydraulic capacity of Paradise Cut and increases the risk of flooding. Lowering the bench 4-5 ft will improve the flow of water and increase its hydraulic capacity. The bench is vegetated with narrow-leaved willow (*Salix exigua*) and other species. This area was determined to provide suitable cover and forage habitat for RBR (pers. comm., D. Williams).

Potential for Impact: Soil will be removed from 26.08 acres (24.39 acres on the north side and 1.69 acres on the south side) of the 38.8 acre bench. In addition, about 3.05 acres of RBR habitat on the bench will be temporarily removed when a temporary haul road is constructed. Thus, a total of 29.13 acres (26.08 acres+3.05 acres) of RBR habitat will be temporarily affected. An area of new high ground will be constructed adjacent to the bench south of and adjacent to the north Paradise Cut levee (Figure 7, Sheet 3). Individual RBR could be directly affected when earthmoving equipment begins work in this area. Loss of habitat and disruption of dispersal corridors will occur as the levee breach is lowered.

Avoidance/ Mitigation/ Restoration Measures: To avoid, minimize, and mitigate for take of RBR when soil is removed to lower the bench and to create new high ground, the following measures will be implemented:

- The Setback Levee (see preceding topic) will be constructed at least one year in advance of lowering the bench. This will allow the creation of RBR habitat that would offset the temporary loss in the bench. New RBR habitat will be created on the levee remnant, the area between the remnant and the Setback Levee, the south slope of the Setback Levee, and the areas where the two breaches will occur. The new habitat will provide an area in which RBR can disperse as well as flood refugia habitat prior to initiating construction activities at the bench.

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Vegetation will be removed from east to west to help drive rabbits toward . Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. Riparian brush rabbits avoid open areas.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.
- After the vegetation is removed an ESA will be established at the west end of the bench area, at the east boundary of the UPRR ROW. A silt fence or other suitable temporary barrier will be used. This barrier will also help prevent RBR from moving back into the bench area. No construction personnel or vehicles will be allowed west of the ESA.
- Temporary signage will be placed at 150 ft intervals along the boundary of the fence warning construction personnel to stay out.
- The construction contractor will be responsible for installing the fence after consulting with the biological monitor.
- The construction contractor will be responsible for maintaining the fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- Disturbed areas of the bench will be revegetated with appropriate native species as described in the Paradise Cut Restoration Plan.

g) Impact 1.7 Construct new water, wastewater, and recycled water lines. Potential temporary direct effect.

Discussion: The locations where these water lines would be installed in Paradise Cut and Stewart Tract have not been determined. The water lines would be installed by trenching.

Potential for Impact: About 0.10 acre of RBR habitat could be temporarily removed during trenching when the new water lines are installed on Paradise Cut. Individual RBR could be adversely affected by construction equipment.

Avoidance/ Minimization/ Restoration Measures: To avoid, minimize, and mitigate for take of RBR during installation of water lines, the following measures will be implemented:

- At least two weeks prior to construction, vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.
- An ESA will be established at the boundaries of the construction zone. The ESA will delimit the area accessible to construction personnel and vehicles. A silt fence or other suitable temporary barrier will be installed prior to construction to prevent RBR from entering the construction zone.
- The construction contractor will be responsible for installing the fence after consulting with the biological monitor.
- Temporary signage will be placed at 150 ft intervals along the boundary of the fence warning construction personnel to stay out.
- The construction contractor will be responsible for maintaining the fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- The construction contractor will remove the fence after construction is completed.
- Disturbed areas will be revegetated with appropriate native species as described in the Paradise Cut Restoration Plan.

h) Impact 1.8. Construct cross-levee. Potential direct effect.

Discussion: The cross-levee is an oversized levee that will be constructed west of and parallel to the West UPRR ROW. This levee will provide flood protection for the new development on Stewart Tract. The cross-levee will be 44 ft wide at the top and 89 ft wide at the base (toe to toe; Appendix C). To construct the cross-levee, trucks and earthmoving equipment will need to operate adjacent to the West UPRR ROW.

Potential for Impact: RBR occur in the West UPRR ROW. Individual RBR could be injured or killed by construction equipment if they ventured outside the vegetated ROW during construction of the cross-levee. (Indirect effects of constructing the cross-levee are discussed in Section III.C.4).

Avoidance/ Minimization Measures: To avoid and minimize take of RBR during construction of the cross-levee, the following measures will be implemented:

- An ESA will be established along the western boundary of the UPRR ROW. The ESA will delimit the area that is not be accessed by construction personnel or vehicles. A silt fence or other suitable temporary barrier will be installed prior to construction to prevent RBR from entering the construction zone.
- The construction contractor will be responsible for installing the fence after consulting with the biological monitor.
- Temporary signage will be placed at 150 ft intervals along the boundary of the fence warning construction personnel to stay out.
- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.
- The construction contractor will be responsible for maintaining the fence and will inspect it daily prior to commencement of construction activities at this location. During construction, the ESA will be inspected once per week by a biological monitor. Any defects will be reported immediately to the construction superintendent.
- The construction contractor will remove the fence after construction is completed.
- The east bank of the cross-levee will be passively restored.

i) Impact 2.0. Loss of RBR habitat at Stewart Tract Pond. Direct effect.

Discussion: The "pond" is an isolated area of open water located on Stewart Tract north of the North Levee. After the new Paradise Cut north levee is constructed, the pond will be located north of it.

Potential for Impact: The 0.84 acre of RBR habitat around the pond is assumed to be lost due to construction of the project on Stewart Tract. Individual RBR could potentially be injured or killed during construction.

Avoidance/ Minimization/ Restoration Measures: To avoid and minimize take of RBR during filling of the pond, the following measures will be implemented:

- At least two weeks prior to construction, herbaceous and shrub vegetation in the construction zone will be removed by hand or power equipment such as a mower, brush cutter, or clearing saw. Immediately prior to vegetation removal, a qualified biologist will survey the area to be cleared to ensure that RBR are not present. The person operating the power equipment will clear only those areas determined by the biological monitor to be clear of RBR by the biological monitor. If RBR are observed, vegetation clearing will cease until the rabbit(s) has left the immediate vicinity and the biologist has determined that no RBR are present.
- Vegetation will be cut to ground level and maintained at ground level throughout the construction period. RBR avoid open areas.

- Prior to commencing construction activities, construction personnel will participate in an endangered species/ sensitive habitat education program presented by a qualified biologist. The program will include identification of RBR, its habitat, the status of the species, and the legal protection afforded under the Endangered Species Act.

3. Phase 2. Year 11 through completion at Year 20 (2025)

Impact 2.1. Construct Paradise Road Bridge. Permanent direct and temporary effects.

Discussion: During Phase 2, the Paradise Road Bridge over Paradise Cut will be widened. Piers need to be installed in Paradise Cut to support the new bridge.

Potential for Impact: During Phase 2, approximately 0.01 acre of RBR habitat would be permanently removed when the bridge piers are installed in Paradise Cut. About 0.17 acre of RBR habitat will be temporarily removed when the bridge piers are installed in Paradise Cut (Table 5).

Avoidance/ Minimization/ Restoration Measures: To avoid, minimize, and mitigate for take of RBR during installation of the bridge piers, the measures identified for the Golden Valley Parkway Bridge, Impact 1.3, will be implemented.

D. Indirect Effects

The Endangered Species Act defines indirect effects as effects caused by a proposed action later in time, but still reasonably certain to occur.

Discussion: Indirect effects to RBR and its habitat are described below and summarized in Table 5 for the three phases.

Indirect effects in **Phase 1a.** No indirect effects would occur in this phase.

Indirect effects in **Phase 1** (Impact 1.9 in Table 5) would occur from the occupation of new residential units, commercial buildings, and other facilities on high ground. Indirect effects would also occur from construction of the cross-levee on Stewart Tract (EDAW 2004).

Indirect effects in **Phase 2** (Impact 2.2 in Table 5) are expected to occur from: 1) Completion of developments at West Village, Lakeside, and Woodlands Districts; 2) Completion of the Employment Center, infrastructure, residences, other buildings; and 3) Conducting maintenance dredging of Paradise Cut canal when/where needed.

Potential for Impact: The increased human population on Stewart Tract from construction and occupancy of housing units will increase the potential that pet cats and dogs will harass or kill RBR. Pet cats and dogs no longer wanted by their owners are often released into the wild. The proximity of Paradise Cut to new residents and employees on Stewart Tract will present a location where pets could be released. To help protect the existing population of RBR in Paradise Cut from predation by pet and feral animals, the following measures would be implemented.

Avoidance/ Minimization Measures for Indirect Effects:

Pets (cats and dogs)

- River Islands will develop informational brochures and/or other literature that will describe the unique aspects of the River Island development relative to the close proximity of federal- and state-listed species in Paradise Cut. The informational brochures will be provided annually to residents and employees at River Islands. The information will discuss the species biology, habitat, endangered status under the Act, threats (cats and dogs) to the rabbits, that their cats and dogs are not allowed to enter Paradise Cut, and any other activities that may in anyway negatively impact the riparian brush rabbit or this species' habitat. The information will discuss the federal and state permits that were required for development and the agreements that River Islands made with agencies. The residents of River Islands will be advised of the uniqueness of Paradise Cut and the habitat it provides for special-status species and measures that could be implemented to control their pets.
- Permanent signs will be placed at regular intervals around Paradise Cut that provide information to the public regarding the status of the area as providing habitat for sensitive species.
- Feral cats are a major cause of mortality for RBR. A fence, wall, or other barrier would be built along the cross levee to prevent people and domestic pets from entering the area between the cross levee and the West UPRR ROW. The barrier would be designed to prevent cats, which might escape from project residences from entering the area between the UPRR berm and the cross levee where RBR are known to occur (EDAW 2004).

Feral Animal Trapping Program.

River Islands will work cooperatively with the City of Lathrop and the USFWS to develop reasonable procedures and guidelines for the trapping of feral animals and black rats in Paradise Cut. Procedures for trapping and processing feral cats (*Felis domesticus*), other feral animals, and black rats as described below, provide a framework with which to proceed.

a) To remove feral animals and black rats from Paradise Cut, River Islands will conduct a trapping program at least twice each year in Lower and Central Paradise Cut. The feral animal trapping program will not occur during December to May, which is the RBR breeding season. USFWS will approve the person or entity conducting the trapping.

b) Trapping will consist of setting a sufficient number of live traps every six months of appropriate size to capture cats and black rats. Captured pets will be taken to a location to be determined by agreement between River Islands and the City of Lathrop.

c) If the pet is immediately identifiable, e.g., has an identification tag, the owners will be notified that their pet has been captured. If the pet owner does not claim it within five days, the pet will be turned over to City Animal Control.

d) If the same pet is captured twice, the pet may be humanely put-down or put up for adoption.

e) If the pet does not have an identification tag and/or is diseased, the pet will be humanely put-down.

IV. GOALS of RBR MITIGATION and MANAGEMENT PLAN

This Section presents an overview of the mitigation and conservation goals for RBR to offset the impacts from the River Islands Project. Independent of the mitigation requirements for the River Islands Project, the RBR Plan includes conservation measures designed to assist USFWS and SJCOG in furthering the goals and objectives of the Recovery Plan for Upland Species of the San Joaquin Valley. Section IV discusses the locations and acreages of preserved, created, and restored habitats included in the Mitigation Area, as well as the preservation of habitat in the Conservation Area.

A. Overview of Proposed Mitigation

The most important habitat elements for RBR consist of cover, forage, and flood refugia. The conservation goals for RBR in this Management Plan include: establish a preserve for RBR; preserve existing RBR habitat; create new RBR cover and forage habitat; create new flood refugia; provide connectivity between existing areas of RBR habitat; and avoid and minimizing potential impacts to RBR during construction.

The River Islands Project would result in 1.93 acres of permanent direct impacts and 36.59 acres of temporary impacts to RBR habitat (Table 5). Most of the impacts to RBR habitat are temporary. The River Islands at Lathrop Project would also result in indirect effects to RBR habitat due to the introduction of urban land uses in the vicinity of RBR habitat.

The avoidance and minimization measures described in Section III, this RBR Plan includes mitigation measures to offset impacts associated with the development of River Islands and additional conservation measures designed to implement the San Joaquin Upland Species Recovery Plan objectives specific to RBR.

All existing RBR habitat currently owned by River Islands would be preserved either as mitigation to offset the Project impacts or to provide future conservation opportunities. The combined mitigation and conservation area would ultimately result in the preservation of about 669.48 acres of RBR habitat, consisting of the following components:

- Preservation of 86.53 acres of existing habitat (Table 9).
- Active restoration (creation) of 220.62 acres of habitat (Table 9) of which 173.19 acres will be included in a preserve.
- Passive restoration of 108.75 acres of habitat (Table 9).
- Included in the acreages noted above are 60.62 acres of levee remnants, land bridges, and floodway restored as RBR habitat (Table 8).
- A total of 301 acres (Tables 7 and 9) would be made available (the "Conservation Area") for future active or passive restoration/ creation of RBR habitat by SJCOG, other individuals or organizations, or by River Islands as a mitigation bank.

1. *Mitigation Measures*

The Project proposes a comprehensive RBR habitat creation and restoration program that will fully offset unavoidable direct, indirect, cumulative and growth inducing impacts associated with the River Islands development. The focus of this RBR Mitigation and Management Plan is on Paradise Cut, which affords an opportunity to establish and restore riparian habitat that would support RBR and other wildlife species.

To offset permanent and temporary direct, indirect, cumulative, and growth-inducing impacts related to the development of the River Islands Project, River Islands proposes the following actions: i) actively restore approximately 112.57 acres of RBR habitat in Paradise Cut; ii) actively restore 47.83 acres of RBR habitat on levee remnants and land bridges; iii) create 12.79 acres of new RBR habitat in the Setback Levee Restoration Area; iv) actively restore 47.43 acres of RBR habitat temporarily affected in the bench area; v) passively restore 100.20 acres in Paradise Cut; and vi) passively restore 8.55 acres on the cross-levee. An additional, 86.53 acres of existing RBR habitat will be preserved and 301 acres in Paradise Cut will be made available for future restoration. A total of 669.48 acres will be preserved and made available for future restoration.

Actively created and restored habitat, including flood refugia (Section IV), would be located on existing and former agricultural lands as noted in Table 7 (Section V). A total of 47.83 acres of habitat will be restored at the "bench" at the east end of Paradise Cut. However, the bench will remain under private ownership and will not become part of the lands preserved under this Plan.

In Phase 2, 100.20 acres currently under cultivation on RU 5 and RU 7 would be fallowed and allowed to convert to RBR habitat (Figure 7 and Table 7).

2. *Conservation Measures*

It is anticipated that at some time in the future agricultural operations will cease on the remaining agricultural lands in Paradise Cut and they will be converted to native habitat. This RBR Plan provides for the future conversion of these remaining agricultural lands. The acres and locations of these (the "Conservation Area") are noted in Table 7 in the column "Acreage available for future restoration." River Islands, other individuals, or organizations may use approximately 301 acres (the Conservation Area) as a future mitigation bank. The Conservation Area may also provide habitat conservation opportunities for the SJCOG in implementing riparian species mitigation requirements of the San Joaquin Multi-Species Conservation Plan.

Either active or passive habitat restoration/creation techniques could be used in the Conservation Area based on the goals and objectives of the entity managing the Conservation Area, but are not required by this Plan. It is anticipated that if SJCOG pursues conservation opportunities within the Conservation Area, preservation of the Conservation Area will offset any mitigation fees that otherwise may be imposed on the River Islands Project under the SJMSCP.

B. Establish Preserve

All areas of Paradise Cut owned by River Islands will be included in a preserve (hereafter referred to as "Preserve"). Lands in the Preserve will be protected in perpetuity by a conservation easement. The Preserve and conservation easement will be established prior to commencement of Phase 1a. A draft outline of an Operations and Management Plan that could be prepared for the Preserve is in Appendix D.

C. Preserve Existing RBR Habitat

Existing RBR habitat in Paradise Cut, as shown on Figure 3, will be included in the Preserve. RBR habitat restored but not owned or controlled by River Islands in Paradise Cut (47.43 acres) will not be preserved under this Plan.

In Phase 2, RUs 5 and 7 (100.20 acres) will be converted from agriculture to riparian and wildlife habitat (Table 7). The conversion of these RUs will be 'passive' compared to 'active' restoration. Passive restoration involves ceasing agricultural operations and allowing the land to be colonized by seeds deposited primarily from adjacent riparian vegetation, wind blown seeds, and birds. All other restoration activities in Paradise Cut involve the planting of container stock and/or cuttings.

D. Create New RBR Cover and Forage Habitat

New habitat will be created on lands owned by River Islands by a) converting agricultural land in Paradise Cut to riparian forest habitat; b) by planting riparian forest vegetation on the levee remnants and land bridges on the north Paradise Cut levee remnants; and c) by planting riparian vegetation in the area of the new Setback Levee and levee remnant.

- In Phase 1, seven RUs will be completely converted to new RBR habitat. In Phase 2, two additional RUs (5 and 7; 100.20 acres) will be converted from agriculture to riparian and wildlife habitat. The conversion of these RUs will be 'passive' compared to 'active' restoration. Passive restoration involves the ceasing of agricultural operations and allowing the land to be colonized by seeds deposited primarily from adjacent riparian vegetation, wind blown seeds, and birds. All other restoration activities in Paradise Cut involve the planting of container stock and/or cuttings.
- In lower and central Paradise Cut, eight Levee Remnants, created by breaching the north Paradise Cut levee, will be vegetated. The riparian vegetation will create new RBR forage and cover habitat. The vegetated levee remnants will provide flood refugia for RBR and other species.
- Three land bridges will be maintained between Levee Remnants 5 and 6, 6 and 7, and 7 and 8. A land bridge is an area where the levee is partially breached. During flood events water will flow over the land bridge between the remnants. After floodwaters recede, the land bridges will provide connectivity between these

remnants. The land bridges will be vegetated to create new forage habitat for RBR as described in the Paradise Cut Restoration Plan.

- A Setback Levee in Upper Paradise Cut will be constructed ± 150 ft north of the north Paradise Cut levee.
- After the Setback Levee is constructed, its south bank, the area between the levee remnant and the levee remnant will be vegetated to create new RBR forage and cover habitat.

Specific restoration and revegetation techniques and species to be used in the agricultural lands in Paradise Cut are described in the Paradise Cut Restoration Plan (Sycamore Environmental 2004). Techniques and species to plant on levee remnants are described in the Paradise Cut Restoration Plan (Sycamore Environmental 2004).

RBR habitat in the bench area in Upper Paradise Cut will be temporarily removed when soil is removed (Figure 3, Sheet 3). After the bench is lowered, it will be restored to RBR habitat as described in this Management Plan. Although River Islands will implement the restoration, they do not own this property. The bench will remain under private ownership and will not become part of the lands preserved under this Management Plan.

E. Create New Flood Refugia Habitat for RBR

A total of 24.84 acres of new habitat suitable as flood refugia habitat will be created in Paradise Cut in Phases 1 and 2 (Table 6). The total includes 2.82 acres on the cross-levee that could be used by RBR and other terrestrial species as flood refugia. (Note: The 24.84 acres of refugia are included in the 60.62 acres of habitat to be created on levee remnants and land bridges, as noted in Table 8.)

In Phase 1, flood refugia habitat for RBR will be created 1) when new high ground is constructed, and 2) when existing levees are vegetated. Flood refugia habitat will be created at three locations in Paradise Cut and in one area on Stewart Tract. Flood refugia habitat will be created when the levee remnants west of the West UPRR ROW and the Setback Levee remnant are vegetated with riparian vegetation.

Also in Phase 1, new flood refugia will be created south of the north Paradise Cut levee (Figure 3, Sheet 3). The new flood refugia will be vegetated as described in this Management Plan. Although River Islands will implement the restoration, they do not own this property. The refugia will remain under private ownership and will not become part of the lands preserved under this Management Plan.

Table 6. Flood refugia habitat created and vegetated.

Location	**New flood refugia (acres)*** (Total area of new feature)
Phase 1	
Create New Flood Refugia (high ground)	
Refugia in bench area adjacent to and south of North Paradise Cut levee (between the East UPRR east and Paradise Weir) (Phase 1)	**1.28** ‡ (1.86)
Setback Levee (Phase 1)	**0.55** (1.67)
Cross-levee (Phase 1); east bank	**2.82** (8.55)
Vegetate Existing High Ground	
Eight remnants of the north Paradise Cut levee	**13.83** (41.9)
RU 15 Levee (Phase 1)	**0.89** (2.70)
Levee Remnant 9 of the north Paradise Cut levee opposite the Setback Levee (Phase 1)	**1.47** (4.46)
Phase 2	
New high ground constructed in RUs 1, 3, 5, 7	**4.0** ‡ (6.64)
Total:	**24.84** (67.78)

* Acres of flood refugia are based on 33% of the total area of the new feature that would not be inundated during a 100-year flood event. ‡ The area of these features was determined from design criteria.

In Phase 1, a 7860 ft long cross-levee will be constructed west of and parallel to the West UPRR West ROW. A cross-section and plan view figure of the cross-levee are in Appendix C. The north end will tie into Stewart Road and the south end into north Paradise Cut levee. The slope on the east face will be at 3:1 and will be vegetated. A dirt road will be maintained at the toe of slope to provide access to the levee face. Approximately 3 ft of freeboard at the top of the levee above the 200-year project design flood line would provide temporary flood refugia (cover and forage) for RBR.

In Phase 2, 1 acre of new high ground (total of 4 acres) will be created on four RUs: at the west end of RU 1, the east end of RU 3, in RU 5, and RU 7 (Figure 7, Sheets 1 and 2). Approximately 1 acre at each location will be above the 100-year flood event. Thus, a total of 4 acres of additional flood refugia will be created in Paradise Cut.

F. Provide Connectivity Between RBR Habitat

After the new channel is constructed north of the existing north Paradise Cut levee, the new Levee Remnants in Paradise Cut will become isolated islands surrounded by water. When the islands in Paradise Cut become inundated in a flood event, RBR will seek high ground, such as the north and south levees along Paradise Cut. The current pre-project conditions do not favor long-term survival on these levees because they lack cover and forage and the RBR are vulnerable to predation from raptors, coyotes, and foxes.

In the post-project conditions, the levee remnants will provide cover and forage during flood events. During flood events, RBR could be deposited on a levee remnant. Although the remnants would function as temporary flood refugia, rabbits would be "trapped" after floodwaters recede because levee remnants will be permanently surrounded by water.

To provide connectivity between Levee remnants 2, 3, and 4 and an island (RU 2) in Paradise Cut, railroad flatcar bridges will be placed across open water at three locations (Figure 7, Sheet 1). To provide connectivity between four Levee remnants (5, 6, 7, and 8), three Land bridges will be established between them (i.e., the area between these remnants will not be completely breached). Levee remnant 7 is currently connected to RU 12 by an existing bridge. Levee remnant 1 is currently and will continue to be connected to RU 3 by an existing dirt farm road.

G. Avoid and Minimize Impact to RBR During Construction

Potential effects to RBR habitat during construction will be avoided or minimized as described in Section III.C.

H. Trapping and Research

1. Trapping

Annual trapping for RBR will be conducted to establish baseline data on the numbers and their locations in mitigation areas. Plans describing trapping methods, materials, personnel, and reports will be prepared and submitted to USFWS.

Trapping for other purposes could also be conducted. For example, RBR could be trapped and removed from mitigation areas by USFWS or entities approved by the Service to establish founder populations for captive breeding programs.

2. Research

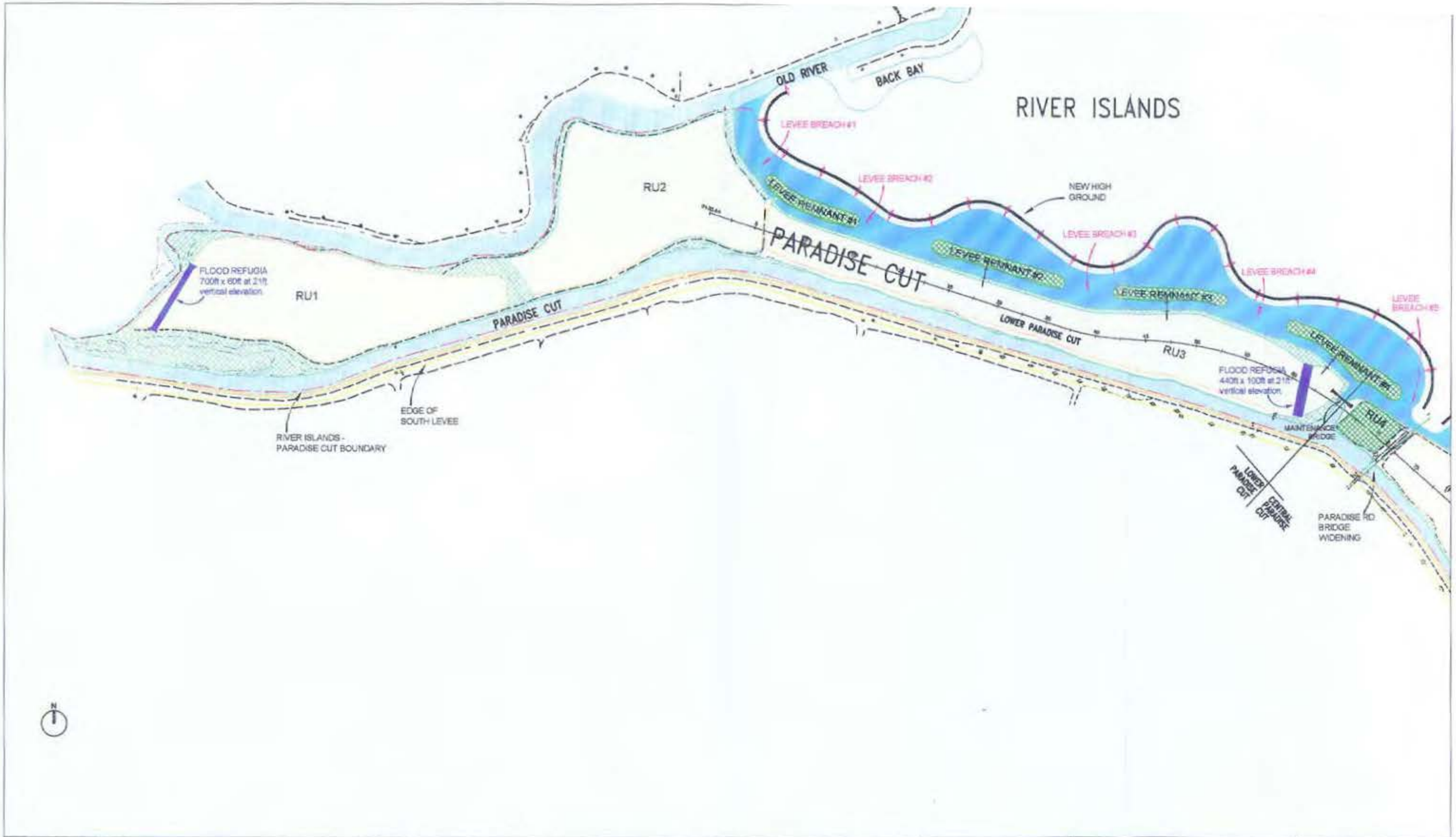
The Preserve will provide opportunities to conduct research on many aspects of RBR biology and ecology. The Preserve Manager will coordinate with USFWS and DFG to facilitate research requests.

I. Success Criteria

The number of rabbits in a population fluctuates over time. Data are not currently available regarding the population dynamics of RBR. The number of RBR present at any given time depends on many different factors such as abundance of forage plants, intensity of predation, competition, flood frequencies, etc.

Rabbit populations periodically fluctuate (pers. comm., D. Williams) and thus the data obtained from yearly census techniques may not be reliable to estimate habitat suitability. The annual trapping results will be maintained in a database controlled by the Preserve. As data accumulate, ecological models could be developed to statistically predict RBR densities. Such data could be useful in detecting long-term trends of RBR populations.

In an area known to support RBR, such as Paradise Cut, their presence can be assumed if the appropriate habitat is present (pers. comm., D. Williams). Thus, the primary approach to determine success under this Management Plan will be to evaluate the condition of vegetation (species and communities) in the Mitigation areas. Management actions will be implemented to ensure that suitable forage and cover species are maintained in the Preserve to benefit RBR.



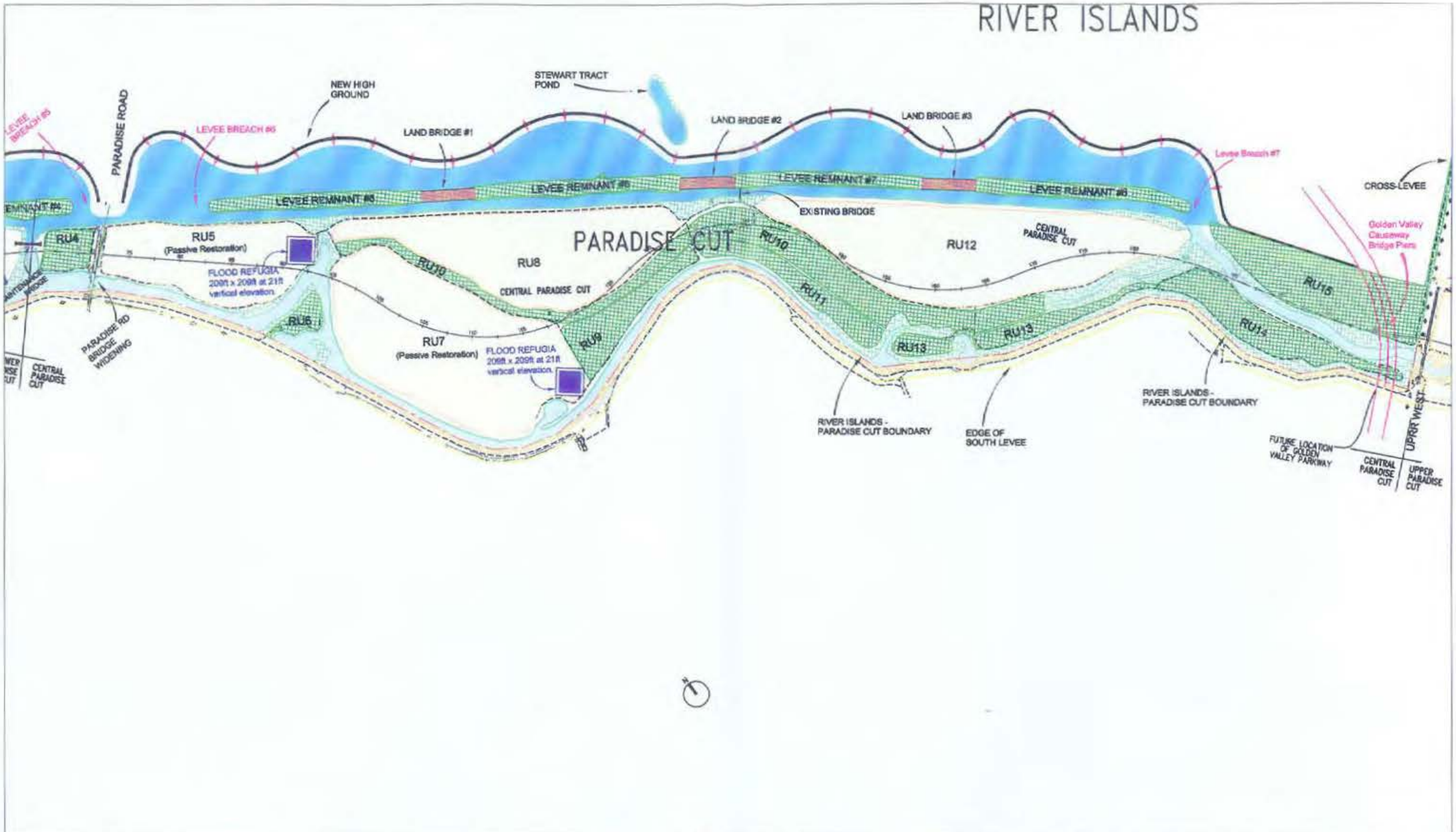
Riparian Brush Rabbit
Mitigation and Management Plan
River Islands at Lathrop
28 April 2004

Figure 7.
Future Conditions in Paradise Cut

= Agricultural Production
= Existing RBR Habitat
= Existing RBR Habitat (Offsite)
= NEW RBR Habitat
= Levee Remnant
= Land Bridge (Max. Elevation 10')
= RR Flatcar Bridge

900' 450' 0 900'
SCALE: 1"= 900'
SHEET:
1 of 3

Sycamore Environmental Consultants, Inc.
Source:
Aerial Photomapping Services,
5 ft Topo Contour Map, 1993 ed.; Carlson,
Barbee & Gibson MSTR.dwg, June 2003 ed.



Riparian Brush Rabbit
Mitigation and Management Plan
River Islands at Lathrop
28 April 2004

Figure 7.
Future Conditions in Paradise Cut

= Agricultural Production
= Existing RBR Habitat
= Existing RBR Habitat (Offsite)
= NEW RBR Habitat
= Levee Remnant
= Land Bridge (Max. Elevation 10')
= RR Flatcar Bridge

900' 450' 0 900'
SCALE: 1"= 900'
SHEET:
2 of 3

Sycamore Environmental Consultants, Inc.
Source:
Aerial Photomapping Services, 5 ft Topo Contour Map, 1983 ed.; Carlson, Barbee & Gibson MSTR.dwg, June 2003 ed.

Riparian Brush Rabbit
Mitigation and Management Plan
River Islands at Lathrop
28 April 2004

Figure 7.
Future Conditions in Paradise Cut

= Agricultural Production
= Existing RBR Habitat
= Existing RBR Habitat (Offsite)
= NEW RBR Habitat
= Levee Remnant
= Land Bridge (Max. Elevation 10')
= RR Flatcar Bridge

900' 450' 0 900'
SCALE: 1"= 900'

SHEET:
3 of 3

Sycamore Environmental Consultants, Inc.

Source:
Aerial Photomapping Services, 5 ft Topo Contour Map, 1993 ed.; Carlson, Barbee & Gibson MSTR.dwg, June 2003 ed.

V. AREAS IN PARADISE CUT TO BE PRESERVED, CREATED, and RESTORED

A. Restoration Schedule

The River Islands project will be developed in three phases over a 20-year period.
Phase 1a: Project Initiation to Year ± 3;
Phase 1: ± Year 4 through Year ± 10 (2015); and
Phase 2: ± Year 11 through completion at Year ± 20 (2025). The Paradise Cut Restoration Plan (Sycamore Environmental 2004) will be implemented as described below.

1. Phase 1a

In Phase 1a, a total of 61.08 acres in RUs 4, 6, 9, 10 and 11 will be converted to riparian and wildlife habitat (Table 7). RU 11 will be converted from a disced, unfarmed area and vegetated to provide habitat for RBR and to create wetland habitats. RUs 4, 6, 9, and 11 are in agriculture.

Restoration Units 1, 2, 3, 5, 7, 8, 12, 13, 14, and 15 will remain in agriculture in Phase 1a. These RUs are among the largest farmed areas in Paradise Cut and are fully irrigated (pers. comm., Paul Gomes). Leaving these areas in agriculture will benefit Swainson's hawk by continuing to provide foraging habitat.

2. Phase 1

In Phase 1, RUs 13, 14, and 15 (49.49 acres) will be converted from agriculture to riparian and wildlife habitat (Table 7). Restoration Units 1, 2, 3, 5, 7, 8 and 12 will remain in agriculture in Phase 1.

3. Phase 2

In Phase 2, RUs 5 and 7 (100.20 acres) will be converted from agriculture to riparian and wildlife habitat (Table 7). The conversion of RUs 5 and 7 will be 'passive' rather than 'active' restoration. Passive restoration involves the ceasing of agricultural operations and allowing the land to be colonized by seeds deposited primarily from adjacent riparian vegetation, by wind blown seeds, and by birds. All other restoration activities in Paradise Cut involve the planting of container stock and/or cuttings.

RUs 1, 2, 3, 8, and 12 will remain in agriculture and will not be converted to habitat under this Plan. However, in Phase 2, 1 acre of flood refugia will be created on RUs 1 and 3 and on RUs 5 and 7. The flood refugia will help RBR populations and other terrestrial species survive floods. The remainder of RUs 1 and 3 will remain in agricultural production.

Table 7. Restoration Units and phasing of conversion from agriculture to habitat.

Restoration Unit (RU) Number	**In Phase 1a: Current use & Convert To:**	**In Phase 1: Convert To:**	**In Phase 2: Create or Convert To:**	**Area of RU available for restoration**	**Acreage of RBR habitat in PC resulting from this plan**	**Acreage on PC available for future restoration**
1	Row & field crop. Remains in agriculture.	Remains in agriculture.	**Create 1 ac of flood refugia.** The remainder remains in ag.	59.29	1	58.29
2	Same	Remains in agriculture.	Remains in agriculture	58.97	0	58.97
3	Same	Remains in agriculture.	**Create 1 ac of flood refugia.** The remainder remains in ag.	67.93	1	66.93
4	Row & field crop. **Convert 5.41 ac to RBR & other species habitat.**	No change from Phase 1a.	No change from Phase 1a.	5.41	5.41	0.00
5	Row & field crop. Remains in agriculture.	Remains in agriculture.	**1. Create 1 ac of flood refugia; 2. Passive restoration of 32.25 ac from ag to RBR & other species habitat.**	32.25	32.25	0.00
6	Row & field crop. **Convert 4.33 ac to RBR & other species habitat.**	No change from Phase 1a.	No change from Phase 1.	4.33	4.33	0.00
7	Row & field crop. Remains in agriculture.	Remains in agriculture.	**1. Create 1 ac of flood refugia; 2. Passive restoration of 67.95 ac from ag to RBR & other species habitat.**	67.95	67.95	0.00
8	Same	Remains in agriculture.	Remains in agriculture.	50.15	0	50.15
9	Row & field crop. **Convert 11.19 ac to RBR & other species habitat.**	No change from Phase 1a.	No change from Phase 1a.	11.19	11.19	0.00
10	Shallow, linear depression. **Convert 29.79 ac to RBR & other species habitat.**	No change from Phase 1a.	No change from Phase 1a	29.79	29.79	0.00
11	Row & field crop. **Convert 10.36 ac to RBR & other species habitat.**	No change from Phase 1a.	No change from Phase 1a.	10.36	10.36	0.00
12	Row & field crop. Remains in agriculture.	Remains in agriculture.	Remains in agriculture.	66.67	0	66.67
13	Same	**Convert 8.07 ac to RBR & other species habitat.**	No change from Phase 1a.	8.07	8.07	0.00
14	Same	**Convert 14.37 ac to RBR & other species habitat.**	No change from Phase 1a.	14.37	14.37	0.00
15	Same	**Convert 27.05 ac to RBR & other species habitat.**	No change from Phase 1a.	27.05	27.05	0.00
			Totals:	513.77	212.77	301.00

B. Levee Remnants and Land Bridges in Paradise Cut

Eight remnants of the north Paradise Cut levee will be vegetated with riparian trees and shrubs (Table 8). The three land bridges west of the West UPRR ROW and Levee Remnant 9 opposite the Setback Levee will also be vegetated. Planting native vegetation on levees and land bridges will be conducted in accordance with the Paradise Cut Restoration Plan (Sycamore Environmental 2004).

Approximately 60.62 acres of riparian habitat (including 24.84 acres of flood refugia) will be created on the eight north levee remnants and three land bridges to provide habitat for RBR and other species. The created habitat will offset habitat lost from construction of the breaches and provide a beneficial effect by increasing the amount of RBR habitat.

Approximately 12.79 acres of new RBR habitat will be created in the Setback Levee Restoration Area, which includes Levee Remnant 9, the area between it and the Setback Levee, the south bank of the Setback Levee, and the area of the two breaches. These habitat features will offset the temporary loss of habitat from creation of the two breaches needed to create the Setback Levee. After the levee is vegetated, it will provide additional flood refugia for RBR.

Table 8. Levee remnants and land bridges on north Paradise Cut Levee.

Feature Number (listed from west to east)	RBR habitat created (acres)	Current Use	Proposed Use
Levee Remnant 1	3.21	Corps project levee	RBR & other species habitat
Levee Remnant 2	3.99	Same	Same
Levee Remnant 3	3.10	Same	Same
Levee Remnant 4	4.38	Same	Same
Levee Remnant 5	6.88	Same	Same
Land Bridge 1	1.04	Same	Same
Levee Remnant 6	7.32	Same	Same
Land Bridge 2	1.10	Same	Same
Levee Remnant 7	5.93	Same	Same
Land Bridge 3	1.09	Same	Same
Levee Remnant 8	7.09	Same	Same
Levee on RU 15	2.70	Same	Same
Setback Levee Restoration Area: Levee Remnant 9; Floodway; and Setback levee	12.79	Levee Remnant 9 is a Corps project levee; new floodway is farmland	Same
Total:	60.62		

C. Summary of Restoration Activities in Paradise Cut

The Paradise Cut Mitigation and Conservation areas will ultimately be incorporated into a Preserve. Thus, all existing RBR habitat (Table 2) currently owned by River Islands will be protected. However, RBR habitat on lands in Paradise Cut not owned by River Islands (186.25 acres; Appendix A) would not be managed by this Plan.

Specific areas in Paradise Cut where riparian habitat will be created or restored under this Plan are listed in Table 9. Restoration techniques are described in the Paradise Cut Restoration Plan (Sycamore Environmental 2004). Existing habitat avoided during construction will be preserved. Habitat created for RBR and other species will be preserved except for the new flood refugia in Upper Paradise Cut, which is not owned by River Islands.

Table 9. Summary of acres in Paradise Cut & summary of RBR restoration & creation acres.

Paradise Cut	Farmed acreage available for habitat creation	Road & open ground	Area of RU available for restoration	Existing RBR habitat adjacent to farmed portion	Total RU acres: Farmed + existing habitat	Acreage of new RBR habitat in PC from this plan	Acreage in PC available for future restoration
LOWER PC	Acres	Acres	Acres	Acres	Acres	Acres	Acres
RU 1	59.29	0.00	59.29	27.40	86.69	1	58.29
RU 2	58.02	0.95	58.97	9.71	68.68	0	58.97
RU 3	61.79	6.14	67.93	8.22	76.15	1	66.93
CENTRAL PC							
RU 4	4.05	1.35	5.41	0.34	5.75	5.41	0.00
RU 5	30.51	1.74	32.25	3.49	35.74	32.25	0.00
RU 6	2.53	1.80	4.33	1.79	6.12	4.33	0.00
RU 7	61.62	6.33	67.95	1.43	69.38	67.95	0.00
RU 8	44.43	5.72	50.15	2.60	52.75	0	50.15
RU 9	9.14	2.05	11.19	0.38	11.58	11.19	0.00
RU 10	28.77	1.02	29.79	0.00	29.79	29.79	0.00
RU 11	8.43	1.93	10.36	2.48	12.84	10.36	0.00
RU 12	60.83	5.84	66.67	7.08	73.75	0	66.67
RU 13	7.78	0.29	8.07	8.34	16.41	8.07	0.00
RU 14	12.97	1.39	14.37	8.71	23.08	14.37	0.00
RU 15	24.17	2.88	27.05	4.57	31.62	27.05	0.00
	474.34	39.43	513.77	86.53	600.31	212.77	301.00

SUMMARY of Restoration and Creation Acreages.

Active Restoration to create RBR habitat:		
a) Active restoration on Restoration Units in Paradise Cut:*	112.57	
b) Habitat restoration on levee remnants and land bridges in Lower & Central Paradise Cut (includes flood refugia):	47.83	
c) Setback Levee Restoration Area: Levee Remnant 9; Floodway; and Setback levee (includes flood refugia):	12.79	
d) Upper PC: Active restoration of bench area; and create flood refugia adjacent to north Paradise Cut levee:	47.43	
Total Active Restoration:		**220.62**
Passive Restoration to create RBR habitat:		
e) RU 5 and RU 7, passive restoration:	100.20	
f) Cross-levee, passive restoration (includes flood refugia):	8.55	
Total Passive Restoration		**108.75**
Total new RBR habitat restored & created (active + passive; a+b+c+d+e+f):		329.37
Total existing RBR habitat preserved in Paradise Cut:		**86.53**
Total new RBR habitat created under this Plan (a+b+c+e+f): **		**281.94**
Total acreage in Paradise Cut available for future restoration:		**301.00**
Total habitat preserved by this Plan and acreage available for future restoration:		**669.48**

* Active Restoration is based on all or portions of RUs 1, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15.

** The 47.43 acre bench area will be restored, but it is not owned and thus will not be managed by River Islands; this acreage is not included in the total new RBR habitat created & preserved of 281.94 acres.

VI. LONG-TERM MANAGEMENT of PROPOSED PRESERVE AREAS

To manage the preserved lands described in this Plan, River Islands proposes to coordinate with the SJCOG regarding the long-term management and maintenance of the Mitigation Area and Conservation Area. Under this approach, SJCOG would manage both the Mitigation and the Conservation Areas on Paradise Cut in conjunction with its management of mitigation areas under the SJMSCP. The Conservation Area also would be available to SJCOG for restoration and creation of riparian habitat as required under the SJMSCP. Under this arrangement, River Islands' payment of SJMSCP mitigation fees could be used by SJCOG to fund the long-term management and monitoring of the Mitigation Area. No long-term management and monitoring is proposed for the Conservation Area.

Alternatively, the River Islands GHAD may serve as the entity responsible for the management and monitoring of both the Mitigation and Conservation Areas. Fees sufficient to fund the long-term management and monitoring of the Mitigation Area will be collected from assessments collected to fund GHAD activities. No long-term management and monitoring is proposed for the Conservation Area.

A. Existing Functions and Values of Preserve Areas

All restoration units in Paradise Cut are currently in agricultural production. RU 10 is an unfarmed irrigation drainage swale that is regularly disced. Farmed areas in the RUs do not currently provide habitat for RBR because they lack sufficient cover and are in active agricultural production. Foraging habitat for Swainson's hawk and other raptors is available at certain times of the year where crops are cultivated. Unfarmed, vegetated areas on islands in Paradise Cut presently provide potential habitat for RBR. Most of these areas are located on the perimeter of the islands. Large trees in Paradise Cut provide nesting habitat for Swainson's hawk and other raptors.

B. Present and Proposed Uses of the Preserve

The present and proposed uses of the Preserve are listed in Table 10.

Table 10. Present and proposed uses of preserve areas.

Mitigation Areas	Present Use	Proposed Use
Paradise Cut	Agriculture	Provide habitat for RBR & other species
North Paradise Cut levee remnants and land bridges	Corps project levee	Vegetate to provide habitat and flood refugia for RBR and other species
Levee remnant (LR 9) opposite the Setback levee	Corps project levee	Vegetate to provide habitat and flood refugia for RBR and other species
Setback levee and the area between it and the remnant levee	Agriculture	Vegetate to provide habitat and flood refugia for RBR and other species
Cross-levee	Agriculture	Provide flood refugia for RBR

C. Ownership Status of Proposed Preserve Areas

Califia, LLC (dba River Islands at Lathrop) currently owns the proposed preserve areas in lower and central Paradise Cut. In Upper Paradise Cut, Califia, LLC has options to purchase or has agreements with adjacent landowners that would allow the creation, restoration, and preservation activities as described in this Plan to occur (e.g., Setback Levee and bench).

River Islands owns or controls 26,690 lineal ft (88%) of the Paradise Cut north levee. River Islands does not own any portion of the Paradise Cut south levee (Figure 3).

D. Present and Proposed Use of Adjacent Areas

Areas adjacent to the proposed preserve areas are currently used for agricultural production of row and field crops. Farming will continue in these areas.

E. Public Education

River Islands will implement an ongoing education program to inform residents, employees, and employers of the River Islands at Lathrop project, and the public, about the need to protect the sensitive biological resources in Paradise Cut and the need to control pets and feral animals in the River Island project area.

VII. LITERATURE CITED and PERSONAL COMMUNICATIONS

A. Literature Cited

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Appendix C – Alternatives Analysis

RIVER ISLANDS AT LATHROP PHASE 2B ALTERNATIVES ANALYSIS

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Tables and Figures

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Acronyms and Abbreviations

ABAG	Association of Bay Area Governments
BA	biological assessment
City	City of Lathrop
Corps	U.S. Army Corps of Engineers
Delta	Sacramento–San Joaquin Delta
EIS	environmental impact statement
FSAs	focused screening areas
LEDPA	Least Environmentally Damaging Practicable Alternative
MSA	metropolitan statistical area
NEPA	National Environmental Policy Act
NHI	Natural Heritage Institute
NRDC	Natural Resources Defense Council
PCC	Paradise Cut Conservation
PCIP	Upper Paradise Cut Improvement Project
RHNA	Regional Housing Needs Allocation
RID	River Islands Development
SJCOG	San Joaquin Council of Governments
UPRR	Union Pacific Railroad
WLSP	West Lathrop Specific Plan

Chapter 1
Introduction

This report summarizes alternatives development and screening for Phase 2B of the River Islands at Lathrop project, a large mixed-use development proposed for the Stewart Tract in the southern Sacramento–San Joaquin Delta (Delta). Most of the project area is within the Secondary Zone of the Delta, but a small "tail" designated for conservation use is within the Primary Delta.[1] Construction is proposed to proceed in three phases (1, 2A, and 2B); only Phase 2B requires federal permitting, and Phases 1 and 2A are currently in construction under state and local authorization.

This alternatives analysis was conducted

- to support the U.S. Army Corps of Engineers' (Corps') review of permit applications for River Islands Phase 2B under Section 404[b][1] of the Clean Water Act of 1972, as amended, and Title 33 United States Code Section 408, and in compliance with the federal Environmental Protection Agency's Section 404[b][1] Guidelines (40 CFR 230 –233); and
- to identify alternatives to be carried forward for analysis in the environmental impact statement (EIS) for River Islands Phase 2B, consistent with requirements of the National Environmental Policy Act (NEPA) and implementing regulations.

Contents of This Report

This report contains the following information.

- A summary of project background and history, including the basic project objective identified by the Corps, and the project purpose and need, as identified by the applicant.
- An evaluation of the project purpose and need, including an assessment of employment and housing trends in the area served by the project, and relevant City of Lathrop plans and policies.
- A brief description of the proposed project and the more focused federal permit action.
- An overview of the alternatives analyzed in the project EIR along with an assessment of their relevance to the requirements of CWA Section 404[b][1] and NEPA.
- A description of the methods used to develop and screen action alternatives.
- A summary of the screening process and its outcomes.
- Conclusions regarding the slate of alternatives to be analyzed in the EIS.
- A reference list for sources used in alternatives development and the preparation of this report.

Once EIS analysis has been completed, this report will be revised to include identification of the Least Environmentally Damaging Practicable Alternative (LEDPA).

[1] The Sacramento–San Joaquin Delta is divided, for planning purposes, into two zones: the *secondary zone,* which is that part of the legally defined Delta that is subject strictly to the authority of local government; and the *primary zone*—an area "of primary State concern and statewide significance" (Delta Protection Commission 2007)—that is subject to land use policy established in the Land Use and Resource Management Plan for the Primary Zone of the Delta (California Department of Water Resources n.d. p.7, Delta Protection Commission 2007).

Information Used in This Analysis

Key sources of data used in the preparation of this analysis include the following.

- GIS data from the California Spatial Library.
- Aerial images provided by AirPhoto and GoogleEarth.
- Housing and employment reports from local and regional government councils and associations.
- Planning documents for San Joaquin County, the City of Lathrop, City of Manteca, City of Tracy, and the San Joaquin Council of Governments.
- Population and employment statistics from local jurisdiction general plans and FedStats.
- The market analysis, project need, and project alternatives information provided in the "applicant's materials" for the overall River Islands project.
- Interviews with San Joaquin County, City of Lathrop, City of Manteca, City of Tracy planning staff, a development expert not involved in the project, and the proponent.
- Biological assessments submitted to the National Marine Fisheries Service and U.S. Fish and Wildlife Service for River Islands at Lathrop.

Specific reference information is provided in the text.

Project Background and History

Stewart Tract is a parcel of more than 5,000 acres in the western portion of the City of Lathrop (City) (Figure 1-1). As identified above, most of Stewart Tract is within the Secondary Delta, with a small "tail" extending into the Primary Delta. The River Islands site occupies the majority of the Stewart Tract and comprises a total of slightly more than 4,900 acres of former and current agricultural and open space land. It is bounded by the San Joaquin River on the north and east, the Old River on the west, and the Paradise Cut flood bypass on the south. Railroad tracks owned and maintained by the Union Pacific Railroad (UPRR) mark the east boundary of most of the site.

The Stewart Tract was first planned for development in 1991, when the City adopted its previous General Plan (City of Lathrop 1991). Several years later, the City's West Lathrop Specific Plan (WLSP) refined the original development vision to center on entertainment-oriented uses, including four theme parks, some 5,000 hotel rooms, and a regional retail mall, along with 8,500 housing units (City of Lathrop 1996). The development proposed in the WLSP was known as Califia/Gold Rush City. Consistent with the development's focus on entertainment, the theme parks were planned as the first components to be constructed, with the retail and residential uses to be added at a later date (City of Lathrop 2003; City of Lathrop 2005).

Shortly after approval of the WLSP and the Gold Rush City concept, economic conditions changed, and development of a major theme park–centered attraction in the Lathrop area no longer appeared economically viable. At the same time, the City experienced a growing need for high-quality employment opportunities and greater housing stock diversity to serve existing residents as well as buyers fleeing the expensive Bay Area housing market. A citizen petition drive resulted in Measure D—eliminating the WLSP's "theme park first" phasing and allowing additional land uses in the West Lathrop area—being placed on the ballot in November 2000 (City of Lathrop 2005).

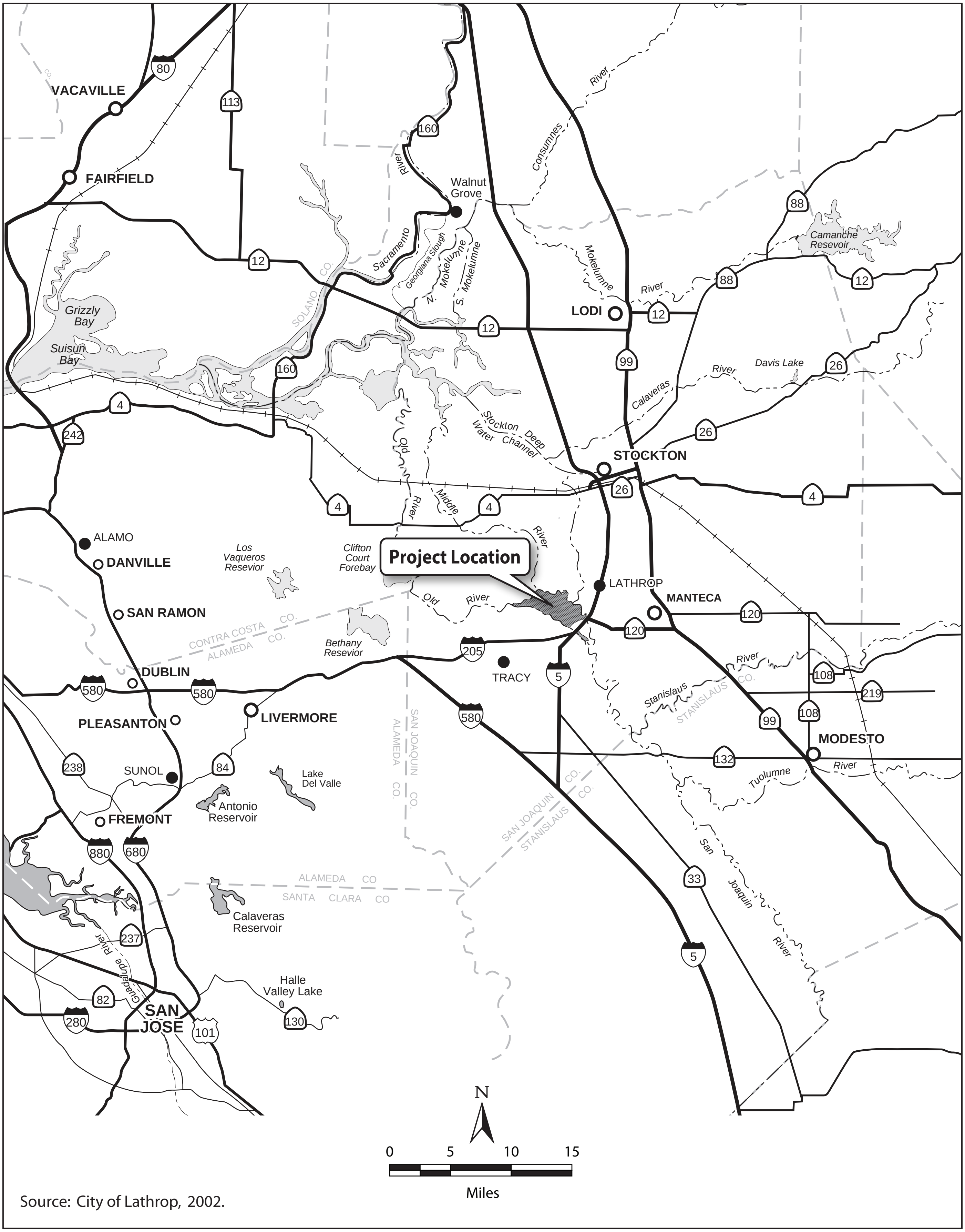


Figure 1-1
Regional Location

Following passage of Measure D, the River Islands at Lathrop project was proposed by Califia as a more appropriate development approach given the changed economic climate. As discussed in more detail below, it would provide a range of residential and commercial uses, including single- and multi-family housing, town and employment center areas intended to attract high-tech uses to the Lathrop area, and water-based recreational opportunities. The River Islands proposal reflected the increased planning latitude allowed under Measure D, but because it differed substantially from the City's original vision for Stewart Tract, it required amendments to the General Plan and WLSP, which were approved in January 2003 (City of Lathrop 2005).

Basic Project Objective, Purpose, and Need

The purpose (Section 404[b][1] *basic project objective*) of the proposed River Islands at Lathrop project is to construct a large-scale, mixed-use project consisting of residential development and a commercial complex, and which may include open space and recreational amenities, located in San Joaquin County or the south Delta area.

River Islands at Lathrop is intended to meet the following needs.

- **Housing—**offering additional housing diversity not currently available in the City of Lathrop, and providing additional housing for workers employed in the Tri-Valley area of southern Alameda and Contra Costa Counties.
- **Employment—**fostering economic and employment development in the City of Lathrop; offsetting the jobs deficit in San Joaquin County, which has experienced some of the state's highest unemployment rates in recent years; and offering a local employment nexus to relieve the current pressure to commute into the San Francisco Bay Area.

The federal action under review for Section 404[b][1] permitting is restricted to a portion of the proposed River Islands development (see *Proposed Project and Federal Permit Action* below). However, the general project purpose/basic project objective and statement of project need identified for the project in its entirety also apply to the focused federal action.

The following section examines the identified project purpose and need in more detail.

Analysis of Need for Project

This section evaluates the need for the River Islands at Lathrop project, based on current and projected trends for population, housing demand and development, employment availability, and commute patterns.

Key trends relevant to the proposed project—examined in more detail in the following paragraphs—include the following.

- San Joaquin County has experienced rapid population growth over the past two decades, particularly in communities closest to the Bay Area, including the City of Lathrop. This trend is expected to continue into the foreseeable future.
- The County has an identified jobs shortfall, with a particular deficit for well-paid and professional employment. The picture is somewhat brighter for the City of Lathrop than for the

County as a whole, but even in Lathrop, almost 40% of employed residents are commuters, and 25% of the labor force (more than half of the commuting population) commutes to the Bay Area.

- The City has been unsuccessful in achieving its state-mandated Regional Housing Needs Allocation (RHNA)[2] affordable housing target through conventional means such as redevelopment efforts, and views large mixed-use projects that include a broad spectrum of housing types as a more promising approach to meeting its fair-share obligation.

The sections below provide additional information on population, housing, and employment in the City of Lathrop and the San Francisco Bay Area, including more detail on each of the issues identified above.

Population and Housing in the City of Lathrop

Overview of Trends

Despite recent dramatic shifts in the real estate market, the overall trend in San Joaquin County and the City of Lathrop in recent years has been one of rapid growth and booming construction. Although it may moderate, this general growth trend is expected to continue, as discussed in more detail below.

Land costs have historically been lower in San Joaquin County than in the more densely developed Bay Area to the west, and in recent decades many workers employed in the Bay Area have sought less expensive housing in San Joaquin County. This resulted in increased construction activity in the northern part of the County, particularly in the cities closest to the Bay Area such as Lathrop and Tracy (Inter-Regional Partnership 2003 p. 24, San Joaquin Council of Governments 2007a p. 5-4). This trend has been projected to continue into the foreseeable future—as of 2003, the Inter-Regional Partnership forecast a Countywide 57% increase in households between 2000 and 2025 (Inter-Regional Partnership 2003 p. 27).

Census data for the past two decades show Lathrop as the second-fastest growing city in the area, behind Tracy and ahead of Manteca, Stockton, and Ripon. Between 1990 and 2000, the City's population grew by more than 50%. Future growth projections vary. Overall, the City's current General Plan anticipates substantial continued growth, with a population of about 30,000 projected for the year 2012 (City of Lathrop 2004 p. 34). Elsewhere, the General Plan projects a population of slightly more than 14,000 by 2008 (City of Lathrop 2004 p. 111), but as of December 2007, the City's population was estimated at approximately 16,400 (Ponton pers. comm.), so a projection of 14,000 residents by 2008 is clearly too conservative.

The San Joaquin Council of Governments' (SJCOG's) most recent Regional Housing Allocation Plan identified the current (2001–2008) housing construction need for the City of Lathrop as 1,029 units. Of these, 285—all targeting the above-moderate income group—were constructed in a recent large

[2] The State of California requires local government organizations to prepare periodic Regional Housing Needs Assessments (RHNAs). The San Joaquin Council of Governments (SJCOG) then uses a demography-based formula to allocate the identified need for new housing construction among its member jurisdictions, with the need broken down by income groups to ensure that each jurisdiction meets its responsibility without disproportion between income groups. Income groups are defined relative to HUD's Median Family Income (MFI) figure, as follows: very-low (less than 50% of MFI), low (50–80% of MFI), moderate (80–120% of MFI), and above-moderate (more than 120% of MFI) (City of Lathrop 2004).

subdivision project by William Lyon Homes (City of Lathrop 2004 p. 149). The remaining 2001–2008 construction need per SJCOG is summarized in Table 1-1 below.

Table 1-1. Identified Construction Need for City of Lathrop, 2001-2008

Income Group	% of Households in City	Construction Need	Constructed 2001–2003	Remaining Need, Per General Plan
Very low	18.3	188	0	188
Low	15.4	158	0	158
Moderate	18.3	189	0	189
Above moderate	48.0	494	285	209
Total:	**100.0**	**1,029**	**285**	**744**

Source: City of Lathrop 2004 p. 150.

Estimates cited in the City's General Plan suggested a greater need than that identified by the RHNA. Based on a study of housing between 1970 and 1990 in nearby mid-sized cities (Ceres, Folsom, Lodi, Manteca, and Turlock)—all of which experienced "aggressive growth" and averaged construction of 400–600 housing units per year over the study period—the General Plan concludes that with an aggressive economic growth program in place, the City could develop an average of 500 units per year over the next 20 years (City of Lathrop 2004 p. 252). This would translate to construction of some 11,000 housing units during the lifespan of the current General Plan (City of Lathrop 2004 p. 37; depending on individual project planning, the current General Plan and zoning map would actually provide for as many as 12,900 housing units over their 20-year lifespan. Thus, approval of several recent urban plan designs, including that for River Islands at Lathrop, is expected to provide housing growth exceeding future RHNA requirements but generally consistent with the General Plan (City of Lathrop 2004 p. 151). To ensure that actual construction—and particularly construction of multi-family units—is sufficient to meet market demand, the City intends to continue its dialogue with the development community, monitor market demand and requests for zoning changes, and initiate zoning changes and annexations as needed to meet the identified demand (City of Lathrop 2004 p. 151.)

As in many parts of California, the Lathrop housing market has experienced a dramatic shift in the last 2−3 years. Prices in Lathrop have declined markedly, and numerous foreclosures have occurred (e.g., California Association of Realtors 2008, Recordnet.com 2008a, 2008b). However, anecdotal reports suggest a sense of "light at the end of the tunnel" (RecordNet.com 2008b), and even with recent changes in the market, as of October 2008 City outreach materials still anticipate substantial population growth in the Stockton-Lathrop-Area over the next decade (City of Lathrop 2008).

Challenges for the Lathrop Housing Market

Lathrop's current General Plan identifies several challenges for the City's housing market.

One such trend is the decreasing affordability of single-family homes (City of Lathrop 2004:165), which was projected to worsen as a result of a tight housing market (2.3% vacancy rate for single-family units in the City, as of the preparation of the current General Plan) (City of Lathrop 2004:140). This challenge may ease somewhat as a result of recent trends in the real estate market, but is unlikely to be rectified entirely by recent price declines, since marginal buyers may have increasing difficulty obtaining mortgage financing in the wake of the "sub-prime crisis" (e.g., About.com 2008).

Another challenge relates to existing high demand for subsidized rental units (City of Lathrop 2004:165). In recent years, the City has had difficulty attracting developers for affordable housing, and although Lathrop met its overall RHNA goals in the prior reporting period, it failed to meet its RHNA affordable housing target, because developers tend to prefer the larger markets in nearby Stockton and Manteca for affordable housing projects (City of Lathrop 2004:103). Large mixed-use projects are envisioned as an alternate, more feasible, way for this smaller city to meet its affordable housing responsibilities. This is particularly true for projects like River Islands at Lathrop that require annexation of new lands to the City, because the current General Plan requires areas proposed for annexation to follow a specific plan process. The specific plan process provides for the integration of a range of housing types and densities into a single planned development, so no developer bears sole responsibility for the affordable housing component. The specific plan process also ensures that infrastructure such as water and wastewater treatment will be available at a capacity appropriate to support the desired range of development densities (City of Lathrop 2004 p. 103).

The West Lathrop Specific Plan is called out in the General Plan as a good example of the specific plan approach, with a range of zoning designed to encourage development of various types of housing (single- and multi-family, at varying densities) and also offering commercial areas that will provide jobs for residents (City of Lathrop 2004 p. 103).

Bay Area Commuter Housing Demand

The recent real estate downturn has also affected the Bay Area market, although various segments of this large and diverse market have been affected differently. In general, the more distal communities and the middle to lower segments of the market have been hit harder by price declines and foreclosures, while more centrally located and/or more affluent areas have remained stronger (Said 2007; Zip Realty 2008).

Overall in recent years (at least prior to the recent downturn), the Bay Area has experienced a shortage of housing due to employment growth combined with a low rate of permitting for new development in many Bay Area communities (Association of Bay Area Governments 2006b p. 41; Association of Bay Area Governments 2006a p. 11; Bay Area Council 2006 p. 4). According to the 2006 Association of Bay Area Governments (ABAG) report *A Place to Call Home,* Bay Area jurisdictions fell short of both permitting and building the housing units needed to meet the level of demand identified by the ABAG RHNA for the 1999–2006 time period.[3] Table 1-2 shows the overall RHNA allocation and the shortfall.

[3] As discussed above, the State of California mandates that designated councils of governments create and implement a methodology to assign portions of regional housing needs to cities and counties. These jurisdictions, based on the allocations, revise their general plan housing elements to "identify development sites and housing policies that will allow the community to meet its housing needs" (Association of Bay Area Governments 2006a p. 10). ABAG has this responsibility for the Bay Area.

Table 1-2. Regional Housing Needs Performance, 1999-2006

RHNA Allocation	Actual Permitted	Percentage Permitted Shortfall	Actual Built	Percentage Built Shortfall
230,743	185,839	20%	173,648	27%

Source: Association of Bay Area Governments 2006a p. 11.

Despite new construction in recent years, the housing shortage in the Tri-Valley (Dublin-San Ramon-Pleasanton-Livermore) area has been substantial enough that the Lathrop General Plan specifically identifies it as an increasingly important factor for the City's housing market (City of Lathrop 2004 p. 30).

Moreover, although the Bay Area housing market has evolved dramatically since 2004, as recently as 2006 the overall housing shortage was projected to continue (Bay Area Council 2006 p. 4), with 1,600,000 jobs but only 600,000 households expected to be added by 2030 (Bay Area Council 2006 p. 4). Thus, unless Bay Area jurisdictions increase their rate of permitting and construction, numerous Bay Area workers will likely continue be forced to commute.

At the same time, many Bay Area workers are voluntarily opting to commute longer distances. Prior to the recent downturn, the shortage of housing coupled with the increasing number of Bay Area jobs had elevated housing prices in the Bay Area (Association of Bay Area Governments 2006a p. 1; Bay Area Council 2006 p. 4) such that the National Association of Realtors (2007) recently identified Bay Area housing as among the most expensive in the country. As of 2006, only 12% of Bay Area households could afford a median-priced home (Association of Bay Area Governments 2006b p. 3); at that time, the median sales price of existing single-family homes in the San Francisco-Oakland-Fremont metropolitan statistical area (MSA) was $736,000, and in the San Jose-Sunnyvale-Santa Clara MSA it was $775,000. For comparison, the median sales price in San Joaquin County in 2006 was significantly lower, at $429,000 (National Association of Realtors 2007). Overall, ABAG has estimated that the price of a home drops by $5,000 for every mile traveled outside of the Bay Area's core[4] (based on recorded home sales in 2005). Even following the downturn, Bay Area prices continue to be some of the highest in the nation (Said 2007). In this climate, many workers have relocated to less costly areas outside the core (Association of Bay Area Governments 2006a p. 1; Bay Area Council 2006 p. 6). One result of this exodus is that as of 1990, more than 18,000 San Joaquin County residents were commuting to workplaces in the Bay Area (Inter-Regional Partnership 2003 p. 24). By 2007, this number had almost doubled, to 35,000 (San Joaquin Council of Governments 2007a pp. 5-4–5-5), and it is expected to continue to rise in coming years.

Like Lathrop's shortage of affordable single-family homes, identified by the current General Plan, the Bay Area price squeeze and the resulting exodus to more affordable areas may be relieved somewhat by declining prices in distal Bay communities, but are unlikely to be eliminated entirely because of the increasing difficulty of obtaining mortgage financing, particularly for subprime borrowers (e.g., About.com 2008).

[4] The Bay Area's "core" is defined as the southwestern part of the San Francisco Peninsula, slightly west of Cupertino (Association of Bay Area Governments 2006a p. 1).

Jobs and Income in San Joaquin County and City of Lathrop

The labor force in San Joaquin County and the area near the River Islands site has grown briskly since the early 1990s. Statewide, labor force growth for the period 1990–2005 averaged 18.7%, while from 1991 to 2004, San Joaquin County experienced 22% growth, and the Cities of Lathrop and Tracy saw 40% and 45% growth, respectively (San Joaquin County 2006 p. 36). Nonetheless, despite the increase in available labor in northern San Joaquin County, the Bay Area, as the primary metropolitan center of Northern California, continues to be a key employment market for San Joaquin County residents. As identified above, approximately 35,000 residents of the County were commuting to employment destinations in the Bay Area as of 2007, about half of them from the Tracy-Manteca area (San Joaquin Council of Governments 2007a pp. 5-4–5-5). There is also a significant income disparity between the Bay Area and San Joaquin County, with the average income per capita in the Bay Area well above that of San Joaquin County (FedStats 2007a; FedStats 2007b; FedStats 2007c; FedStats 2007d).

Taken together, these data suggest that San Joaquin County has abundant available labor, but limited opportunities for employment, and particularly for well-paid employment.

The picture is somewhat brighter for the City of Lathrop than for the County as a whole; as of 2000, the median household income in the City was $55,037, up from $35,835 in 1990. For comparison, the Countywide median household income increased from $30,635 to $41,282 over the same period. Lathrop is unusual among small, recently incorporated cities in that it has an established employment base, which includes the Sharpe Army Depot and several large industries such as Libby-Owens-Ford and Simplot (City of Lathrop 2004 p. 37). Despite this, however, as of 2000, almost 90% of the City's employed residents were commuters working outside of Lathrop, and almost 50% were working outside the County (City of Lathrop 2004 p. 116). By 2007, about one-quarter of the City's employed residents were commuting to the Bay Area (San Joaquin Council of Governments 2007a pp. 5-4–5-5). Thus, Lathrop's relatively high median income must be attributed at least in part to workers traveling outside the area for higher-paying jobs.

Jobs/Housing Balance in San Joaquin County, City of Lathrop, and Bay Area

A community is considered to have a jobs/housing imbalance when its jobs/housing ratio deviates from the standard of 1.5 jobs per household (Inter-Regional Partnership 2003 p. 5). Currently, Lathrop, Manteca, Tracy, and San Joaquin County as a whole all have a jobs/housing shortfall, which is projected to increase as population growth outpaces jobs growth in San Joaquin County (Inter-Regional Partnership 2003 p. 25; San Joaquin Council of Governments 2007a p. 5-6), as summarized in Table 1-3. Note that the largest individual jobs/housing decreases have been predicted for the Cities of Lathrop and Tracy (Inter-Regional Partnership 2003 p. 25).

Table 1-3. Jobs/Housing Ratios for San Joaquin County, 2000 and 2025

Community	2000	2025 Projected	Percent Change 2000–2025
San Joaquin County	1.00	0.90	–10%
City of Lathrop	0.88	0.58	–34%
City of Manteca	0.85	0.76	–11%
City of Tracy	0.75	0.55	–28%

Source: Inter-Regional Partnership 2003 p. 25.

The Bay Area also has a jobs/housing imbalance, but with more jobs than housing (Bay Area Council 2006 p. 4). This condition is projected to continue, as discussed above—about 1.6 million new jobs are anticipated by 2030, compared with only 600,000 new households (Bay Area Council 2006 p. 4). The resulting shortage will continue to cause workers to seek housing outside of the Bay Area, which in turn has the potential to exacerbate the jobs/housing imbalance in San Joaquin County, and particularly in commuter communities such as Tracy and Lathrop. Thus, despite recent adverse trends in the real estate market, the longer-term picture in the Lathrop area appears to be one of growth (e.g., City of Lathrop 2008).

City of Lathrop Plans and Policies

Lathrop General Plan

"New Town" Planning Concept

The General Plan identifies the City as "ideally situated to play an important role in the economic and cultural growth of the region" (City of Lathrop 2002a p. i), with a unique opportunity to plan and manage its future development. Because the City had its origins as an industrial center along a major highway, it lacks a central downtown area and many of the services available in other cities of similar size. Thus, rather than revitalizing and expanding an original town center as many small, recently incorporated municipalities do, the City envisions its future as lying in the creation of a "new town" that capitalizes on the employment, housing, trade, and transportation trends that are reshaping urban expansion in surrounding areas, including the Bay Area (City of Lathrop 2004 p. 29).

Factors cited by the General Plan (p. 29–31) as supporting the "new town" planning approach include the following.

- **Location and accessibility.** The City straddles I-5, the major through route serving the length of California and the entire West Coast, and is located at a nexus of transportation infrastructure, including railroads, highways, Delta waterways, and an international airport.
- **Economic potential.** Rapid population growth—ascribed to pleasant living conditions, proximity to Delta and Sierra recreational opportunities, reasonable housing prices, and reduced traffic congestion—has created a rapidly growing population and a robust economy.
- **Large, potentially developable acreages controlled by a small number of landowners.** The ability to work with a small number of landowners who control large acreages will allow collaborative development of planned communities offering a "highly efficient and exceptionally

pleasant community environment" that is specifically designed to avoid many of the problems facing established communities that grew in a less planned fashion.

Role of Specific Plans

Specific plans serve as the primary tool to implement the policies of the General Plan. As such, they serve three basic purposes or functions (City of Lathrop 2004 p. 47).

- **Interpretation—**identifying the degree of flexibility allowed in implementing General Plan policies, and providing development standards, along with guidance for phasing and coordination of development activity.
- **Illustration—**describing and providing ample illustration showing design approaches for public and private developments to satisfy General Plan standards.
- **Regulation—**promulgating the standards and requirements for the development process, as well as regulations specific to individual projects within a plan area.

The General Plan requires the preparation of specific plans for several areas, including the existing community east of I-5, the Stewart Tract (West Lathrop area), and undeveloped areas north of Stewart Tract, between I-5 and the San Joaquin River to the west (City of Lathrop 2004 p. 47). It also delineates the planning vision for each of these areas in considerable detail.

West Lathrop Specific Plan

The current West Lathrop Specific Plan (WLSP) is one of several area plans created in response to the General Plan requirement for specific planning in areas proposed for City annexation. It envisions a community that would improve the "jobs/housing balance for the region, contribut[e] regional traffic solutions for the area's busy highways, construct…substantial improvements to the area's flood protection and creat[e] new habitat areas set aside solely for the well-being of endangered species" (City of Lathrop 2003 p. v). The community is further described as offering a "balanced, mixed use sustainable community compared comprised of residential and commercial development" (City of Lathrop 2002a p. i); with diverse housing opportunities "allowing a range of lifestyles from more urban to more rural" (p. v) characterized by "variety in house types and prices" (p. II-8).

Several of the WLSP's objectives speak directly to the City's identified need for additional housing and increased employment opportunities, including the following (City of Lathrop 2002a p. II-1, II-3).

- **Objective 1A—**"Add to the economic vitality of Lathrop by providing more local jobs, homes and revenue-generating land uses."
- **Objective 2A—**"Provide diverse types of housing in West Lathrop that respond to the needs generated by increased employment as well as regional housing needs."

River Islands' proposed mixed-use format, with abundant commercial and retail uses, also reflects language in the City's Measure D, which specifically requires any development on Stewart Tract to provide long-term benefits to the City (including generation of "substantial employment") before new housing is occupied, or pay an economic development fee as a penalty (City of Lathrop 2002a pp. II-8–II-9).

Proposed Project and Federal Permit Action

As proposed, River Islands at Lathrop would provide approximately 11,000 homes and 5 million square feet of commercial space, along with water-oriented recreational amenities and preserved open space. All of the project's developed areas would lie within the secondary zone of the Delta, with a small portion of land under resource conservation protection in the Primary Delta.

At buildout, the project is planned to encompass three distinct units.

- **River Islands Development (RID) Area—**The RID Area would contain all of the project's new urban development, including residential neighborhoods, commercial areas, and support infrastructure such as schools and fire and police facilities. It would also provide a central lake, canals, and other constructed internal waterways; several parks and a system of trails; a town center marina on a new "back bay" water feature along the San Joaquin River; and boat docks built outside the Stewart Tract levee system along the San Joaquin and Old Rivers, and also within the newly created internal lake.
- **Upper Paradise Cut Improvement Project (PCIP) Area—**The PCIP Area is a portion of the Paradise Cut flood control bypass planned for expansion to provide additional flood conveyance capacity, improving flood protection for Stewart Tract and downstream areas.
- **Paradise Cut Conservation (PCC) Area—**In the PCC area, new setback levees would be constructed along Paradise Cut, and the existing levee would be breached. The remnants of the existing levee would be restored with riparian vegetation to provide fish and wildlife habitat—in particular, habitat for riparian brush rabbit *(Sylvilagus bachmani riparius)*—and a visual amenity. Similar activities are also planned on a much smaller scale in the PCIP Area.

Because of the project's large size and complexity, construction and occupancy would be phased over a period of 25–30 years. Phase 1, which is currently in progress, includes placement of fill to raise the southeast portion of the Phase 1 area above the 100-year flood elevation; construction of a new levee system to flood-protect the remainder of the Phase 1 area, including new levees set back from existing levees along the San Joaquin River, a "cross levee" along the UPRR alignment between Paradise Cut and the Employment Center, and a new interior levee; and development of 4,049 single- and multi-family residential units along with 60% of the proposed commercial space and public amenities. Phase 2, also in progress, comprises two subphases. The earthmoving portion of Phase 2A, which involved filling approximately 22,250 linear feet of the setback area between the new ring levee and existing levees to create a "super levee" high-ground perimeter for improved flood protection, has been completed. The remainder of Phase 2A will entail construction of a comparatively small number of additional residences and associated infrastructure. Phase 2B would construct the remainder of the homes, commercial space, and public amenities, as well as the Paradise Cut flood protection and conservation improvements.

Phases 1 and 2A were designed to be independent of Phase 2B. Because Phases 1 and 2A would avoid impacts on U.S. jurisdictional waters, they do not require federal permits. However, Phase 2B would involve activities within United States jurisdictional waters in the San Joaquin River, Old River, and Paradise Cut, and would also affect small jurisdictional wetland areas internal to Stewart Tract. As a result, Phase 2B requires federal approvals under Section 404 of the Clean Water Act, Sections 10 and 14 of the Rivers and Harbors Act, and 33 United States Code Section 408. River Islands Phase 2B is therefore the subject of this alternatives analysis and constitutes the federal action that will be analyzed in the Corps' upcoming EIS.

As proposed, Phase 2B would consist of approximately 6,700 mixed-density dwelling units and 2 million square feet of commercial and retail space. Included in the development proposal are associated open space public amenities. Although Phase 2B is proposed to include docks, a constructed back bay, and other amenities for aquatic recreation, the Corps has identified the project as non-water dependent because its basic project objective could be satisfied without these components.

As proposed, Phase 2B would impact a total of slightly more than 37 acres of jurisdictional wetland/waters of the Unites States. Of this, 9.5 acres would represent permanent loss, with the remainder reflecting a combination of temporary disturbance and conversion to other waters. Impacts are broken down in more detail in Table 1-4; note that Table 1-4 uses the *Temporary* category for both recoverable disturbance and conversion to another type of jurisdictional habitat.

Table 1-4. River Islands Phase 2B Impacts on Jurisdictional Waters

	Approximate Acreage of Impact	
Activity	Temporary*	Permanent
Central drainage ditch converted to Inner Lake	4.49	–
Central drainage ditch converted to Paradise Cut Waters	0.36	–
Fill/borrow excavation, central drainage ditch	–	6.36
Fill of pond and associated habitat during construction of Paradise Cut setback levee	–	2.98
Excavation of wetland to lower terrace bench near Paradise Weir	15.24	–
Dredging to connect Paradise Cut Canal with Old River	0.25	0.03
Breaching of existing Paradise Cut levee after new levee complete	6.48	–
Fill to install riparian brush rabbit crossings connecting Paradise Cut islands	–	0.04
Fill to install Maintenance Bridge connecting Paradise Cut islands	–	0.03
Trestle and falsework construction for Golden Valley Parkway bridge over San Joaquin River	0.021	–
Footings for Golden Valley Parkway bridge over San Joaquin River	–	0.022
Trestle and falsework construction for Golden Valley Parkway bridge over Paradise Cut	0.144	–
Footings for Golden Valley Parkway bridge over Paradise Cut	–	0.015
Trestle and falsework construction for Paradise Road bridge over Paradise Cut	0.046	–
Footings for Paradise Road bridge over Paradise Cut	–	0.01
Dredging of San Joaquin River for Lathrop Landing back bay entrance	0.414	–
Cut for levee breach for Lathrop Landing back bay entrance	0.263	–
Total	**27.708**	**9.487**

Source: EDAW in prep.

* The *Temporary* impacts category includes recoverable disturbances as well as conversion to another type of jurisdictional waters.

Alternatives Analyzed in River Islands at Lathrop SEIR

The following sections summarize the previously identified alternatives to the proposed project and assess the relevance of these CEQA alternatives to CWA Section 404[b][1], NEPA, and the upcoming EIS for the federal action relative to River Islands at Lathrop.

At the time the River Islands SEIR (City of Lathrop 2003) was prepared, the assumed construction phasing differed from what is now proposed. The current project phasing was analyzed in an Addendum to the 2003 SEIR, certified in July 2005 (City of Lathrop 2005), which concluded that because there would be no change in the "full project buildout" condition under the revised project phasing, the proposed change in phasing did not affect the selection of alternatives to be analyzed or the impacts of the alternatives as described in the SEIR. Accordingly, this discussion focuses on the alternatives as described and analyzed in the SEIR.

SEIR Alternatives

The City of Lathrop's SEIR for the River Islands at Lathrop project analyzed the following alternatives to the project as proposed.

- **No Project (No Development)—**No project actions would be undertaken at the Stewart Tract site, and existing agricultural uses would continue, although the potential for future development under other, unrelated proposals is acknowledged.
- **No Project (West Lathrop Specific Plan)—**Stewart Tract would be developed under the previous West Lathrop Specific Plan, which envisioned an entertainment-oriented complex with four theme parks as well as commercial and residential uses.
- **Environmental Constraints (50% Development)—**Development on the project site would be reduced by 50% compared to the proposed project, and the remaining undeveloped acreage would remain in agricultural production. Levee improvements sufficient to remove the developed portion of Stewart Tract from the 100-year floodplain would be constructed, and Paradise Cut would be improved to offset potential effects on downstream flood stage elevations. This alternative would also include several project modifications targeting reduction of specific impacts associated with the project as proposed. These include preserving an existing pond in the southwestern portion of the developed area to reduce wetland impacts; prohibiting or delaying development on 10 acres of the site that are zoned MRZ-2 for sand resources; and several other community layout modifications to reduce noise, transportation, and cultural resources impacts.

Relevance to CWA Section 404[b][1] and NEPA Requirements

Alternatives screening for the City's SEIR reflected the entire River Islands at Lathrop project ("full project buildout" condition), equivalent to Phases 1, 2A, and 2B as now proposed, and was governed by the CEQA goals and objectives adopted by the City of Lathrop for the project.

The City's goal for the proposed River Islands project was identified as

> …completion of a mixed-use residential, employment, and commercial development that would provide a variety of housing, employment, and recreational opportunities in Lathrop (City of Lathrop 2003 p. 3-7).

The City's project objectives included

- enhancement of the City's positive image;
- contribution of mixed-use and commercial land uses with the potential to become a citywide and regional "focal point";
- provision of local jobs, homes, and revenue-generating uses to complement other development in the City;
- creation of "signature landscaped parkways and waterways" to "define an attractive image for West Lathrop"; and
- provision of a wide range of housing types to accommodate "most income levels" (City of Lathrop 2003 pp. 3-7, 3-8).

As discussed in *Basic Project Objective, Purpose, and Need* above, the basic project objective/project purpose identified by the Corps for the proposed federal action incorporates the City vision for large-scale, mixed-use development, but is more regional in scope. Consequently, the EIR alternatives screening process, governed by the City's project goal, was too geographically focused to fully satisfy the Section 404/NEPA mandate.[5] Nonetheless, although the SEIR alternatives analysis has limited applicability to the requirements of CWA Section 404[b][1] and NEPA, there is some potential for carryover, as summarized in the following section.

SEIR Alternatives and Potential for EIS Carryover

The No Action Alternative that NEPA requires to be analyzed in the EIS would be similar in some ways to the SEIR No Project (No Development) Alternative. However, the two alternatives differ in at least one key detail. As identified above, the SEIR No Project Alternative was described as involving no development on Stewart Tract, with Stewart Tract remaining in agriculture unless or until some future project were to be approved. In contrast, because River Islands Phases 1 and 2A have already been approved and are being constructed under the required state and local permitting, this level of development will be assumed as part of the current federal No Action Alternative baseline (see memorandum "Federal Action and No Action Conditions—CWA Section 404 Permitting for Proposed River Islands at Lathrop Development", dated September 15, 2006).

The No Project (West Lathrop Specific Plan) Alternative will not be carried forward for EIS analysis. This alternative is no longer feasible, since the prior entertainment-oriented West Lathrop Specific Plan was superseded by the passage of Measure D in 2000, and any future development on Stewart Tract would need to proceed under the current West Lathrop Specific Plan.

The Environmental Constraints (50%) Development Alternative cannot be carried forward in its entirety for EIS analysis, because it was intended as an onsite alternative to the originally proposed phasing for all of River Islands at Lathrop, while onsite alternatives to the federal action must focus

[5] Note however that while Section 404[b][1] alternatives screening must cover the entire area referenced in the basic project objective, in order to satisfy NEPA, any alternatives carried forward for EIS analysis (hence, any alternative that is permittable in practice) must satisfy the project purpose *and* be capable of meeting the more focused project need, which relates specifically to the City of Lathrop planning vision.

specifically on River Islands Phase 2B. However, the general approach of identifying specific outcomes associated with the proposed project, and developing feasible project modifications to reduce or avoid them, is appropriate under both CWA Section 404[b][1] and NEPA. This is explored further in Chapter 4 (*Screening Process and Outcomes, Onsite Alternatives*).

Chapter 2
Screening Methods

EPA Requirements

The CWA Section 404[b][1] alternatives analysis process is governed by EPA's 404[b][1] Guidelines (40 CFR 230–233). Among other provisions, EPA's Restrictions on Discharge prohibit the Corps from issuing a permit if a practicable alternative to the proposed activity exists that would have less extensive adverse impacts on the aquatic ecosystem, as long as that alternative does not have other significant adverse environmental consequences. In practice, this means that the Corps can permit only the Least Environmentally Damaging Practicable Alternative, or LEDPA (40 CFR 230.10[a]).

From a pragmatic perspective, alternatives development and screening must center first and foremost on the ability to meet the basic project objective, but the Restrictions on Discharge recognize that what represents a "practicable" means of achieving the basic project objective is project-dependent. Thus, as appropriate (depending on project-specific constraints), the development and screening of alternatives must address cost, technological feasibility, and logistical factors, all of which can vary from project to project (40 CFR 230.10[a]).

Under the Restrictions on Discharge, practicable alternatives may include alternate locations, if it is feasible for the applicant to obtain, use, expand, or manage them (40 CFR 230.10[a]). Further, unless the Corps identifies a proposed project as water-dependent, consideration of alternate locations must include upland (non-aquatic) sites—for projects that are not water-dependent, it is assumed that practicable alternatives exist that do not involve discharge into specific aquatic sites, and the burden of demonstrating the necessity to use an aquatic site and carry out the project as originally proposed rests with the applicant (40 CFR 230.10[a]).

Implications of Basic Project Objective and Project Purpose/Need for Alternatives Screening

As discussed in Chapter 1, River Islands at Lathrop was proposed to

- provide housing diversity not currently available in the City of Lathrop;
- increase housing availability for workers employed in the Tri-Valley area to the west; and
- foster employment development in the City of Lathrop, helping to offset the jobs deficit in San Joaquin County and relieve existing pressure to commute into the Bay Area.

These purposes are in accord with the Lathrop General Plan (City of Lathrop 2004), as well as the West Lathrop Specific Plan (City of Lathrop 2002a). The needs they reflect are consistent with trends identified by the Inter-Regional Partnership (2003) and ABAG (2006). Accordingly, this analysis treats them as valid constraints on alternatives development and screening.

Satisfying the basic project objective is usually construed as synonymous with meeting the project's NEPA purpose and need. In some cases, however—River Islands is a good example—there are subtle differences that require the basic project objective and project purpose/need to be considered separately, as independent but closely related constraints.

Under EPA's *Restrictions on Discharge,* CWA Section 404[b][1] alternatives screening is intended to identify ways of achieving the basic project objective other than through the project as proposed. This can imply a need for some flexibility in alternatives development; for instance, in some cases, multiple smaller development projects may achieve the basic project objective as well or better than a single large project, while reducing impacts on aquatic resources.

However, the basic project objective identified for River Islands at Lathrop stipulates "*a* large-scale mixed-use project" [emphasis added]. Thus, although it might theoretically be possible to satisfy the project purpose and need by constructing several small mixed-use projects, or developing commercial and residential districts in separate locations, the basic project objective is interpreted as requiring a single development that provides residential and commercial uses within the same planned community. The screening methods used in this analysis were therefore designed to identify alternate sites capable of supporting a single large mixed-use development that would satisfy the identified project purpose and need.

Alternatives Development and Screening Approach

The methods used in this analysis were based on and consistent with the project-specific screening protocol developed by the Corps for River Islands (U.S. Army Corps of Engineers 2007 pp. 5–8), which in turn was guided by the dual mandates of CWA Section 404[b][1] and NEPA. In general, the protocol requires that alternatives (which may include alternate sites and/or alternate configurations using the Stewart Tract site) be assessed for the following parameters:

- ability to achieve basic project objective,
- potential for extensive adverse aquatic impacts,
- practicability, and
- preliminary environmental outcomes.

The first three steps were intended as "go/no-go" steps, where alternatives that failed to meet a specified criterion would be eliminated from further consideration. The final step was intended to be a comparative assessment that ranked the remaining alternatives against each other to identify those warranting further analysis. In practice, however, no viable alternate sites were identified, so no ranking was performed for offsite alternatives. A limited number of alternate onsite approaches was identified, none of which offered the potential for complete avoidance of aquatic resources effects. Thus, combining onsite approaches—rather than screening some out—turned out to be a more effective way of developing onsite alternatives. As a result, although the alternate onsite approaches were evaluated for their ability to reduce aquatic resources impacts and screened for unacceptable environmental outcomes such as greatly increased effects on listed species, they were not ranked *per se*.

Table 2-1 provides a step-by-step overview of the screening process as it was applied for off- and onsite alternatives. Additional information on governing assumptions and the specific success criteria used for each step is given in Chapters 3 and 4, which discuss the screening process and outcomes for off- and onsite alternatives, respectively.

Note that although the overall process is broadly parallel for off- and onsite alternatives, it was applied slightly differently. This is because the conceptual sequence differs. With offsite alternatives, the first step is to identify feasible alternate sites; project approaches (offsite alternatives) can then be developed and screened. The primary focus with offsite alternatives is thus to identify appropriate alternate sites. With onsite alternatives, the site is already known, and the process focuses on development of alternate approaches, followed by identification of the most promising ones and elimination of the least promising ones.

Federal court has ruled that alternatives to a proposed action must be assessed relative to the time when the applicant entered the market (*Bersani v. U.S. Environmental Protection Agency,* 850 F.2d 36 [2d Cir. 1988]). The time of market entry for River Islands at Lathrop is taken to be November 2000, when Measure D was passed, establishing the current development vision for the Stewart Tract. However, the EPA Guidelines also require alternatives to be practicable, and, as discussed in Chapter 1, the Lathrop-Tracy-Stockton area has been developing rapidly—the 8 years that have elapsed since the identified time of market entry have witnessed substantial changes in the planning climate and in the development status of vacant lands.

Even the shorter period since the Corps published its NOI in June 2005 has been eventful. For instance, the South Schulte area in the City of Tracy's Sphere of Influence was under the approved South Schulte Specific Plan in June 2005, but since that time the South Schulte Specific Plan has been terminated and the City of Tracy, with publication of its updated general plan in 2006, has redesignated the South Schulte area with the "urban reserve" land use designation (City of Tracy 2006c p. 2-2). In Manteca, two new specific plans have been developed inside Manteca city limits: (1) the Southwest Manteca Employment Center in the southwest portion of the community (City of Manteca n.d.a), and (2) the Airport Way Planned Employment Center (City of Manteca n.d.b). These lands, and others that like them are already under approved planning documents, are pragmatically unavailable for alternate development at the present time, regardless of their status at the time of market entry.

Because of the rapidly changing planning environment and the long duration of the River Islands planning and approvals process, alternatives screening was forced to consider current development status as a practicability constraint. To ensure that analysis focuses on approaches that would have the potential to offer genuinely practicable alternatives to the action as proposed, this analysis prioritized conditions as of the time of analysis (completed in October 2008) in searching for potential alternate sites.

Table 2-1. Overview of Screening Methodology Discussed in Chapters 3 and 4

Screening Step	Approach/Activities
Offsite Alternatives (Alternate Sites)	
1—Basic Project Objective and Aquatic Impacts Evaluation	Tentative geographic limits and extent of the area potentially satisfying the basic project objective (*the screening area*) were identified. The screening area was evaluated for regions with extensive wetlands and waters that could make the LEDPA unlikely or difficult to achieve.
2—Practicability Evaluation	Lands within the screening area were evaluated for factors relevant to project practicability, as follows. Adequate access to Lathrop and to a major commute corridor connecting to the Tri-Valley area.

Screening Step	Approach/Activities
	Potential to connect with utility service. Availability for development. Zoning compatible with the proposed project. (Areas currently under an inappropriate zoning designation that could potentially be rezoned given the current planning climate—e.g., agriculture—were included in the "compatible" category.) Adequate size to accommodate a large mixed-use community (at least 3,000 acres). Physical suitability to support a large mixed-use planned community. Feasibility of acquisition.
3—Preliminary Evaluation of Environmental Outcomes	Alternate sites were to be assessed and ranked for their potential impacts on non-aquatic environmental resources. In practice, since no feasible alternate sites were identified, this step was not performed.
Onsite Alternatives	
1—Development of Alternatives Concepts *(replaces Basic Project Objective and Aquatic Impacts Evaluation)*	Alternate project approaches using the Stewart Tract were identified using the following constraints. Onsite alternative concepts must use proven, currently available construction approaches. Onsite alternatives should provide mixed uses similar to those in proposed Phase 2B (i.e., to satisfy the basic project objective and project purpose and need). Onsite alternative concepts must offer the potential to reduce or avoid aquatic resources impacts associated with proposed Phase 2B.
2—Practicability Evaluation	Because onsite alternative concepts rely on known construction approaches, all were assumed to be practicable.
3—Preliminary Evaluation of Environmental Outcomes	Any approaches that—based on preliminary, screening-level evaluation—would have the potential for unacceptable outcomes such as greatly increased effects on listed species were to be eliminated. In practice, no such approaches were identified, and no approaches were eliminated at this step.
4—Combination of Alternate Onsite Approaches to Create Alternatives	Since none of the alternate onsite approaches offered a stand-alone solution, approaches were combined into more comprehensive onsite alternatives.

Chapter 3
Screening Process and Outcomes, Offsite Alternatives

This chapter describes the steps used to screen areas outside the Stewart Tract for potential alternate project sites. It also presents the results of each screening step.

Details are given only for steps that materially affected the screening outcome; for these steps, the following information is presented.

- The rationale for including the step; its relevance to basic project objective and/or project purpose and need.
- Any guiding assumptions and their basis or source.
- The screening criteria used; in most cases, these link directly to the rationale and/or the guiding assumptions.
- Methods used in the screening analysis; that is, how the criteria were applied in practice.
- Step-specific outcomes.

For the steps that did not result in the exclusion of any areas from consideration, a brief summary is provided, but details are omitted for brevity.

Step 1—Basic Project Objective and Aquatic Impacts Evaluation

Step 1a—Basic Project Objective

Because the basic project objective and project purpose and need are geographically based, screening for alternate sites must focus first on site location. The Corps' basic project objective identifies geographic limits for project siting: within San Joaquin County and/or the south Delta area. To meet the identified purpose and need, alternate sites must further allow convenient and rapid access to the City of Lathrop and the Tri-Valley area. Ideally, to fully satisfy the purpose and need, alternate sites should be within or in very close proximity to the City of Lathrop's existing urban growth limit.

Step 1a Assumptions

1. Commute traffic will continue to be heavy on the major commute corridors in the project vicinity, including I-5, I-580, I-205, SR 120, and SR 132.

   Source/Basis: The recently updated San Joaquin County Regional Transportation Plan (San Joaquin Council of Governments 2007b) bases its planning on a projected 60% increase in population by the year 2030. Although badly needed improvements to several routes are proposed (see San Joaquin Council of Governments 2007a and 2007b), traffic volumes will continue to increase as the County's population grows, and infrastructure capacity is unlikely to outpace population growth.

2. Commute times to the Tri-Valley area from areas east of Manteca, north of Lathrop, and south of the intersection of I-580 with the San Joaquin–Stanislaus county line could be unacceptably long.

   Source/Basis: For a project with a large housing component to be viable in San Joaquin County, which is still largely rural and lacks the density and diversity of employment to support such a project, the project site must be within a feasible commute to a larger employment market. Housing and employment trends cited in the Lathrop General Plan (City of Lathrop 2004; see discussion above) indicate that many people are willing to undertake long drives to access Bay Area employment combined with lower San Joaquin County housing costs. However, it is difficult to establish with certainty "how far is too far" for a project intended to access the Bay Area employment market. Instead, this analysis focused on the area known to supply a large commuter population to the Bay Area—the Lathrop-Tracy-Manteca area and surrounding less-developed lands.

3. A large mixed-use project would be very difficult if not impossible to implement in the Primary Zone of the Delta, so consideration of alternate sites focused on areas outside the Primary Zone. Alternate sites within the Primary Zone were not considered.

   Source/Basis: Policies and implementation approaches for projects in the Primary Delta are given in *Land Use and Resource Management Plan for the Primary Zone of the Delta* (Delta Protection Commission 1995), which provides stringent planning guidelines to protect the Primary Delta's environmentally sensitive lands for agriculture, wildlife habitat, and recreation.

   One of the Plan's key goals is to retain the existing pattern of land use in the Primary Delta, which is now primarily agricultural. Other uses, such as recreation, are supported only where they do not conflict with agriculture or wildlife habitat use (Plan Policy P-2). New development is restricted to existing communities where appropriate infrastructure and services (including flood protection) are already available (Policy P-4).

   Thus, although new development is possible in the Primary Delta, its nature and location are highly restricted. A large, mixed-use project intended to provide a vibrant employment and residential center would be incompatible with the overarching goal of protecting agricultural, recreational, and habitat uses.

Step 1a Criteria

Given the assumptions above, the Corps has determined that to satisfy the basic project objective and offer the potential of meeting the project purpose and need, alternate sites must be located

- in San Joaquin County or the south Delta, but outside (south of) the Primary Delta boundary;
- west of Manteca, south of Lathrop's northern limit, east of the Coast Ranges, and within the San Joaquin Valley (U.S. Army Corps of Engineers 2007 pp. 2–3).

Step 1a Screening Methodology

GIS data provided by the California Spatial Information Library were used to map the area defined by the location criteria above. This area is referred to hereafter as the *screening area*.

Step 1a Results

The screening area is shown in Figure 3-1. Note that because the Corps has identified the project as non-water-dependent, screening evaluation included lands that are not adjacent to water (i.e., upland sites). Note also that the screening area is deliberately inclusive, incorporating some lands that would meet the basic project objective but could be marginal or unsuccessful in meeting the project purpose and need, which focus on the City of Lathrop. This is intended to ensure broad consideration of site characteristics and availability.

Step 1b—Aquatic Impacts

Under Step 1b, the screening area shown in Figure 3-1 was evaluated for areas with extensive jurisdictional waters or wetlands that should be ruled out of further consideration because they would be unlikely to support the LEDPA.

Development in areas along the San Joaquin River southwest of I-5 and along the Old River west of I-5 would have the potential for extensive impacts on jurisdictional habitat, particularly if the site had a long river frontage. However, sites in this area might still offer the potential to develop a project that would represent the LEDPA, depending on the precise site boundaries and the design of the project.

Consequently, no areas were ruled out during this screening step.

Step 2—Practicability Evaluation

Step 2 evaluated lands within the screening area for their practicability as sites for a large mixed-use development. As outlined in Chapter 2, this evaluation considered site access, utilities service, the development approvals process in each jurisdiction, and the availability of various lands for development (which in turn is a function of current development status; existing land uses and zoning; and parcel size, shape, and ownership).

Step 2a—Access and Utilities Service

To offer the potential of satisfying the project purpose and need, alternate sites must provide adequate access to a major commute corridor connecting northern San Joaquin County to the Tri-Valley area—i.e., I-5, I-205, I-580, or SR 120—and must also be readily accessible to/from the City of Lathrop. Potential alternate sites must also be close enough to existing utilities infrastructure to ensure that water, sewer, and stormwater service can feasibly be provided.

GIS analysis using ESRI ArcMap 9.2 showed that the entire screening area is within 5 miles of major commute corridors (Figure 3-2) offering access to the Tri-Valley area and City of Lathrop. The entire screening area is also within 5 miles of at least one existing water district (Figure 3-2), sewer district (Figure 3-2), and stormwater district (Figure 3-2). No portion of the screening area was ruled out based on site access or availability of utilities (Figure 3-2).

Step 2b—Development Approvals Process

Screening also considered the relative complexity and difficulty of the development approvals process in San Joaquin County and the Cities of Lathrop, Tracy, and Manteca and found that it does not provide a useful discriminator for practicability. For proposed "new communities,"[6] the County requires a General Plan amendment that identifies the planned source of water and documents compliance with General Plan requirements. If the amendment is adopted, a master plan, specific plan, and public financing plan are then required (San Joaquin County 1992 p. Vol 1, IV-14–15, VII-1). The three Cities have similar planning requirements for new large-scale development, as follows.

- The City of Lathrop requires specific plans for development of large undeveloped areas within the City's Sphere of Influence (City of Lathrop 2002b p. 2-19, Mullen pers. comm.). It explicitly identifies the need for specific plans covering "the existing community east of Interstate 5", "Stewart Tract west of the San Joaquin River", and Subplan Area #2 (the Lathrop area west of I-5 to the San Joaquin River) (City of Lathrop 2002b p. 2-19).
- In the City of Tracy's Sphere of Influence, much of the land remaining in large, unbuilt tracts is designated *urban reserve*, "relatively large, contiguous, geographic areas" where the City of Tracy intends to "to provide guidance regarding the vision and types of land uses allowed while still allowing flexibility in location of these uses" (City of Tracy 2006a p. 2-23). Some of this land was previously under the South Schulte Specific Plan, which has since been disapproved by the City. Before development can proceed in an urban reserve area, the City of Tracy requires that the developer prepare General Plan amendments and a specific plan or PUD (City of Tracy 2006a p. 2-23, Tim pers. comm.), and that the area have in place a plan for annexation and adequate connection to and supply from utilities (Tim pers. comm.).
- The current City of Manteca General Plan does not require specific plans as a prerequisite for approval of large-scale development, but it does strongly encourage their use (City of Manteca 2003 p. 12-56). The City also has a "growth management system" consisting primarily of guidelines established by the City Council, with the support of the Growth Management Committee (City of Manteca 2003 pp. 2-24–2-26).

Because all of the local jurisdictions have a similar planning process, the relative ease or difficulty of development approvals was not used to eliminate any areas from further consideration.

Step 2c—Availability for Development

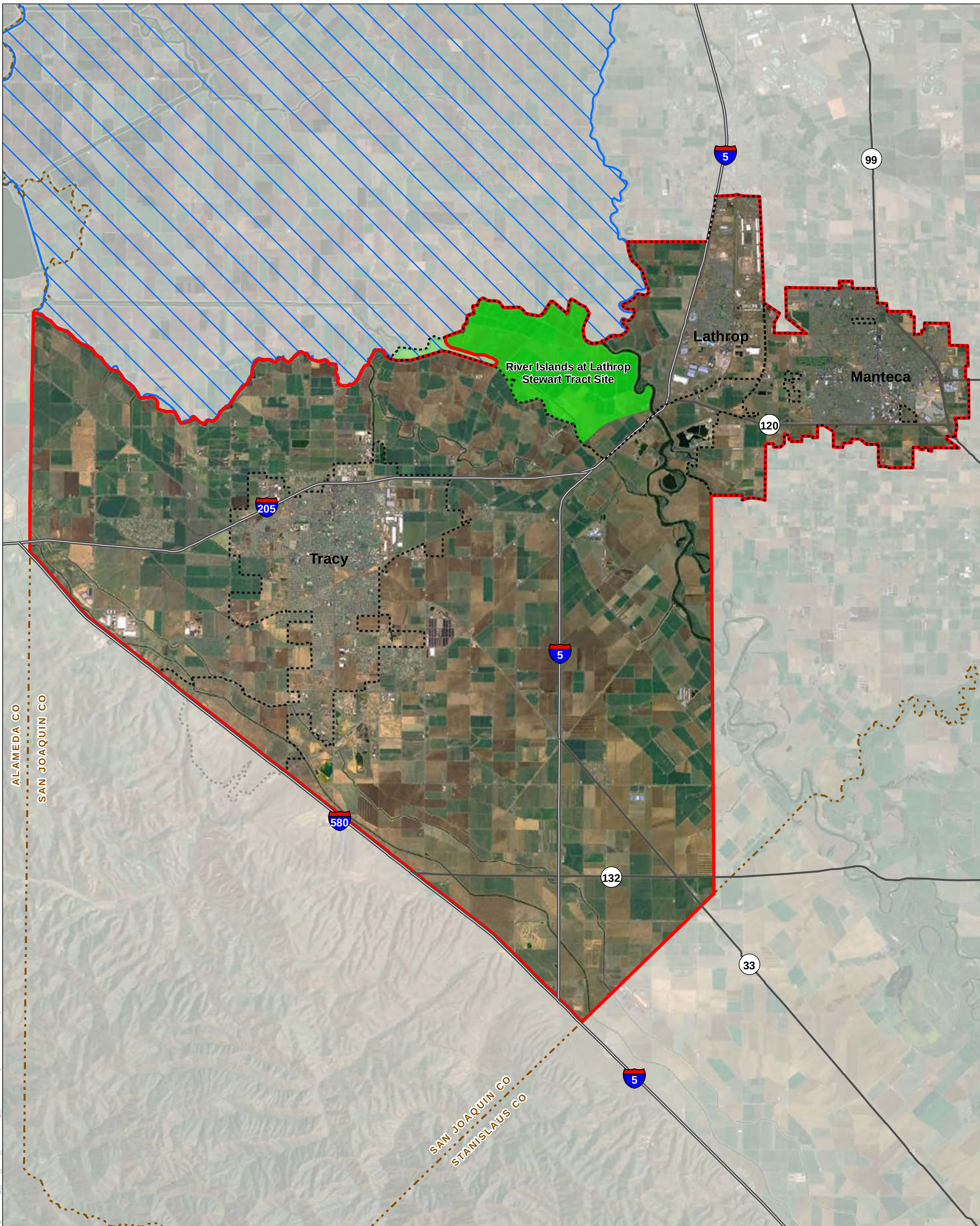
The next step in screening was to identify lands within the screening area that are potentially available for development and are under land use zoning compatible with a large mixed-use project. Screening focused first on the current development status of lands within the screening area. Lands not eliminated based on their development status were then evaluated for zoning compatibility.

Step 2c Assumptions

1. Areas within existing city limits were assumed to be developed or planned for development in the near future and therefore unavailable for a large mixed-use project.

   Source/Basis: Air photos show areas within current city limits as mostly developed, with no extensive "gaps." As discussed further under Step 2e below, a project meeting the basic project

[6] A *new community*, in the context of the San Joaquin County General Plan, is a newly created, planned community that maintains an identity distinct from nearby communities. New communities are developed at urban densities and have neighborhoods, commercial areas, employment centers, and their own utility infrastructure and public services (San Joaquin County 1992 pp. Vol. 1, IV-7–8). New development in San Joaquin County is encouraged to occur as infill in developed areas, in newly annexed areas of cities, or in new communities, so that development remains compact (p. Vol. 1, IV-1–2).



Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway

River Islands at Lathrop
Stewart Tract Site
Inside Screening Area
Outside Screening Area, within Primary Delta

Figure 3-1
Alternatives Screening Area

N

0 0.5 1 2 3 4
Miles

August 2010

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA

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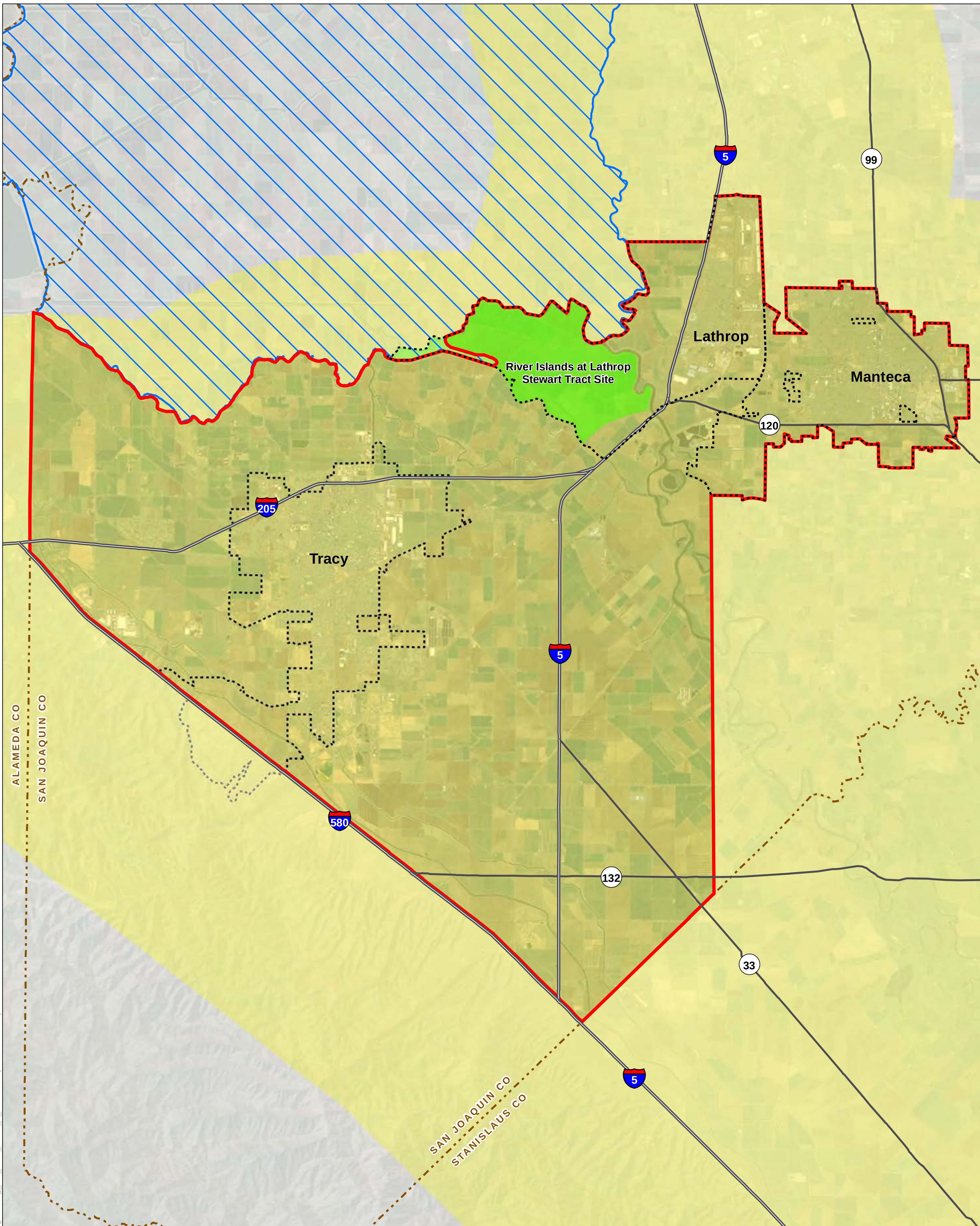

Screening Area Boundary

Primary Delta

City Limits

County Line

Interstate

State Highway

Area Within 5 Miles of a Major Commute Corridor

Current screening step shown in bold font.

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Figure 3-2
Area Within 5 Miles of a
Major Commute Corridor

N

0 0.5 1 2 3 4
Miles

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA

Path: K:\Projects_2\USACE\05044_05\mapdoc\AltSites\screening_20070907\NewLogo\10\Fig_3-2_Area_within_5_Miles.mxd (KA 08-13-2010) objective and project purpose and need would require a large acreage; redevelopment or infill were considered very unlikely to offer enough area to satisfy the "large-scale mixed use" stipulation of the basic project objective.

2. Areas covered by approved specific plans or equivalent planning documents were considered pragmatically unavailable for alternate new development proposals.

   Source/Basis: Modifying the development proposal for land that is already under an approved specific plan would involve amending or superseding an existing plan. Existing specific plans are presumed to reflect the development vision and goals of the local jurisdiction. Consequently there would be no impetus to supersede the existing plan, and the feasibility of replacing an existing, approved development proposal with a new project is uncertain.

3. Several types of land uses were assumed to be incompatible with the nature of the project as captured in the basic project objective. Other land uses are assumed to be compatible or potentially compatible. Zoning compatibility assumptions are itemized and explained in Table 3-1.

Table 3-1. Evaluation of Zoning Compatibility with Proposed Project

Zoning Designation	Compatibility with Proposed Project	Basis for Compatibility Evaluation
Industrial (including light industrial, heavy industrial, business industrial park, truck terminals, airport)	Incompatible	Most types of industrial land uses introduce noise, aesthetic, traffic, and/or other effects that could diminish the quality of life in residential uses.
Quarry, minerals extraction	Incompatible	Like industrial uses, quarries and other extractive land uses may be associated with noise, traffic, and/or air quality (dust) effects that are incompatible with residential uses.
Freeway commercial	Incompatible	Freeway commercial is typically a wholly commercial land use, lacking the residential component that is essential for mixed-use development.
Agriculture	Potentially compatible	In the rapidly developing communities of the San Joaquin Valley, land is being progressively converted from agricultural uses to accommodate commercial and residential development. Land designated agricultural would thus likely be relatively easy to redesignate, in accord with recent trends in the area.
Commercial, residential	Potentially compatible	Planned communities typically integrate commercial and residential land uses with recreational and public land uses. Both of these zoning designations are thus potentially compatible with the proposed project.

Zoning Designation	Compatibility with Proposed Project	Basis for Compatibility Evaluation
Open space, resource conservation	Potentially compatible	Recreational areas are commonly designated open space. Resource conservation areas are also frequently incorporated into a planned community, as is the case with River Islands at Lathrop. Both of these land uses are generally compatible with at least some components of planned communities. However, specific open space or resource conservation areas could be incompatible, so individual evaluation would be needed.
Public facility	Potentially compatible	Planned communities typically provide a wide variety of public land uses, including schools, community centers, parks, and utilities facilities. Most sites designated for public facilities would be compatible with a planned community, although a few likely would not, such as wastewater treatment plants or cemeteries.

Step 2c Criteria

Lands with the following characteristics were considered available for development of a large mixed-use project.

- Not developed already, and not currently approved for development:
  - outside the developed area of existing communities (assumed to be defined by existing city limits, as discussed above);
  - not within an area covered by an approved specific plan or equivalent planning document;
  - not otherwise evidenced to be under large-scale grading (assumed to be precursory to development) or construction.
- Under a zoning designation identified as compatible or potentially compatible with mixed-use development:
  - not designated for *industrial, freeway/road/highway commercial*, or *airport* land use by the relevant general or specific plan,
  - outside existing and planned quarry areas.

Lands failing to meet any one or more of these criteria were considered unavailable for large-scale mixed-use development.

Step 2c Screening Methodology

Step 2c used ESRI ArcMap 9.2 to map existing city limits, areas under approved specific plans, and areas of incompatible zoning/land uses. Areas within these boundaries were excluded from further consideration as alternate sites.

Mapping of city limits, specific plan areas, and zoning designations relied on GIS data provided by the State of California (California Geographic Information System 2004) and the additional City and County sources listed in Table 3-2.

Table 3-2. City and County Planning Documents Used in Development Status and Zoning Evaluation

Jurisdiction	Document Sources
San Joaquin County	• San Joaquin County General Plan 2010 (San Joaquin County 1992) • "Mountain House plans" o Mountain House New Community: Master Plan (San Joaquin County 1994) o Mountain House area map in County General Plan (San Joaquin County 1998) o Mountain House New Community: Specific Plan II (San Joaquin County 2005a) o College Park at Mountain House: Specific Plan III (San Joaquin County 2005b)
City of Lathrop	• Comprehensive General Plan for the City of Lathrop, California (City of Lathrop 2004) • City of Lathrop General Plan Map: 20 Year Plan (City of Lathrop 2004) • West Lathrop Specific Plan (City of Lathrop 2002a) • Initial Study and Notice of Preparation for the South Lathrop Specific Plan EIR (City of Lathrop 2006)
City of Manteca	• City of Manteca General Plan 2023 (City of Manteca 2003) • City of Manteca General Plan Map (City of Manteca 2006)
City of Tracy	• City of Tracy General Plan (City of Tracy 2006a) • City of Tracy General Plan Land Use Designations Map (City of Tracy 2006b) • Map of South Schulte Specific Plan area (now designated "urban reserve") (City of Tracy 2006c:Figure 2-1)

The mapping and elimination process proceeded in the following order.

1. Areas within city limits.
2. Areas with approved specific or area plans, and areas otherwise planned for City development (e.g., additional City of Tracy "urban reserve" areas).
3. Areas with incompatible zoning or quarry land uses. Note that a few parcels in the screening area include lands under different zoning designations; any parcel with land under incompatible zoning (see Table 3-2) was eliminated in its entirety, even if the incompatible zoning covers only a portion of the parcel.

Screening was sequential, such that Step 2 considered only areas that had passed Step 1 (outside city limits), and Step 3 considered only areas that had passed Steps 1 and 2 (outside city limits and outside approved specific plan areas).

Finally, inspection of recent aerial images from AirPhoto (2005) indicated that some additional areas other than those mapped and eliminated in Steps 1–3 showed signs of development. Using these aerial images, and confirming with aerial images from GoogleEarth (2007), a GIS analyst classified parcels as either sparsely developed or densely developed. ESRI ArcMap 9.2 was used to record the location and extent of parcels identified as densely developed. These parcels were also eliminated from further consideration.

Most areas were clearly identifiable as either sparsely or densely developed, but in some cases, judgment was required, as summarized below.

- Sparse Development
  - Areas of many small farms that are adjacent to each other were considered sparsely developed and thus available for development.
- Dense Development
  - Areas that are undeveloped but show evidence of residential-style road construction were considered densely developed and thus unavailable.
  - Areas shown in County GIS data and in aerial images as being divided into multiple small ("residential-sized") parcels were considered densely developed and thus unavailable.
  - Industrial areas with paved roads, parking areas that show signs of use (such as the presence of trucks), or large or multiple adjacent smaller buildings were considered densely developed and thus unavailable.

Step 2c Results

Figure 3-3 shows areas within city limits. All lands within existing city limits were excluded from further consideration.

Figure 3-4 shows the extent of the West Lathrop Specific Plan and south Lathrop Specific Plan areas in Lathrop, the "urban reserve" in the City of Tracy SOI, and the Mountain House plans in the unincorporated County. Areas currently under approved specific plans or otherwise planned for development were also excluded from further consideration.

Figure 3-5 shows areas designated *industrial* or *freeway commercial/service* by the Comprehensive General Plan for the City of Lathrop, the City of Manteca General Plan 2023, the City of Tracy General Plan, or, for areas outside city limits and approved specific plan areas, the San Joaquin County General Plan 2010. Figure 3-6 shows the current extent of quarry lands in the screening area. All of these areas of incompatible land uses were excluded from further consideration.

Figure 3-7 shows areas that were not excluded in previous development status steps, but show evidence of large-scale development, grading, or construction on recent air photos, and were therefore excluded from further consideration.

The resulting area eligible for further consideration for alternate sites is an irregular polygon comprising approximately half of the original screening area (yellow shading on Figure 3-7). Most of the areas excluded from further consideration are located near the three cities in the screening area. Isolated patches of development east of I-5 south of Manteca, along I-580, and north of the I-205/I-580 intersection were also excluded.

Step 2d—Parcel Size and Shape

The next phase of practicability screening evaluated the remaining lands within the screening area (all those still in consideration following Steps 1 through 2c) for the feasibility of assembling a parcel of appropriate size and shape to support a large mixed-use development consistent with the basic project objective and project purpose and need.

Step 2d Assumptions

1. A parcel of 3,000 acres or more would be required.

   Source/Basis: In its entirety, River Islands at Lathrop is proposed to involve approximately 4,800 acres (4,500 in the Secondary Delta and 300 in the Primary Delta). Phases 2 and 2A have an area of approximately 1,500 acres, and Phase 2B would have an area of approximately 3,300 acres as proposed (City of Lathrop 2005 p. 1-1), accommodating some 6,000 residences and 2 million square feet of retail and commercial space.

   Materials submitted by the proponent in support of their 404[b] permit application identify that the proponent considers a large-scale mixed-use community as one that comprises more than 8,000 dwelling units and 3 million square feet of non-residential uses. The proponent's materials further identify that to support an economically viable mixed use community capable of attracting Bay Area employment-generating uses into the South Delta/San Joaquin County region, a minimum of 3,000 acres would be required (River Islands 2006).

   As proposed, River Islands Phase 2B falls short of the first criterion (8,000 dwelling units, 3 million square feet of non-residential uses) but exceeds the second (3,000 square feet). Any alternate site would be physically separate from River Islands Phases 1 and 2A and would not be able to rely on their population or commercial uses to support a new project's economic viability; a project constructed on an alternate site would need to achieve independent economic viability, and thus would need to meet the 3,000-acre size criterion. (Note also that in order to satisfy the 8,000 units/3 million-square-feet threshold on a 3,000-acre parcel, an alternate offsite project would require substantially denser development than that proposed for River Islands Phase 2B.)

2. The parcel should consist of contiguous lands, and be regular and compact (not elongate) in shape.

   Source/Basis: A planned community derives its cohesive character and functionality in part from its layout, which in turn reflects the shape of the parcel it is built on. Consequently, alternate sites must not only be large enough to support a project meeting the identified need, they must be appropriately shaped.

3. The parcel should not be internally divided by inholdings or physical barriers such as the area's major roadways.

   Source/Basis: The presence of inholdings that cannot be incorporated into community planning is potentially disruptive to the cohesive functionality of a planned community. Significant features such as major roadways can also divide a community physically.

   The screening area contains three busy multi-lane interstate highways that act as physical barriers within the area: I-580 (which defines the south boundary of the screening area), I-205, and I-5.

   Two state highways in the screening area—SR 120 and SR 132 (San Joaquin Council of Governments 2007b p. 6-2)—also act as physical barriers because of their width and the volume of traffic they carry. SR 120 and SR 132 are both "major transportation facilities" in San Joaquin County (San Joaquin Council of Governments 2007b p. 15-1–15-2) and primary corridors for east-west transportation (San Joaquin Council of Governments 2007b p. 6-2). Both suffer from impaired service and are scheduled for widening by 2016 (San Joaquin Council of Governments 2007b p. 6-PL1).

SR 120 is the connector between I-5 and SR 99 in southern San Joaquin County. SR 120 has been identified as needing improvements for "congestion relief" (San Joaquin Council of Governments 2007b p. 10–25), and local residents have submitted comments on the draft Regional Transportation Plan expressing (concern about local roadway conditions and safety" (San Joaquin Council of Governments 2007b p. 5-6). SR 120, furthermore, is projected "to experience a substantial increase in total demand (p. 6-3). For this reason, the SJCOG 2007 Regional Transportation Plan has slated SR 120 for many improvements, including widening from four to six lanes, with NEPA analysis to be completed by 2012, and improvements by 2016 (San Joaquin Council of Governments 2007b p. 6-PL1).

SR 132 is the primary east-west corridor in the southern part of the County (San Joaquin Council of Governments 2007b p. 6-2). SR 132 has a history of impaired level of service due in large part to commute traffic from southern San Joaquin County to the Bay Area (San Joaquin Council of Governments 2007b p. 12-6). The SJCOG 2007 Regional Transportation Plan has slated this highway for widening from two lanes to four lanes, with NEPA analysis to be completed by 2010, and improvements by 2016 (San Joaquin Council of Governments 2007b p. 6-PL1).

In light of these conditions (existing congestion, and planned widening projects, which would create a wider road right-of-way) a planned community straddling I-5, I-205, SR 120, or SR 132 would be divided and thus likely to be unsuccessful as a cohesive unit.

Step 2d Criteria

Portions of the screening areas satisfying all of the following characteristics were considered physically appropriate to support an alternate project site:

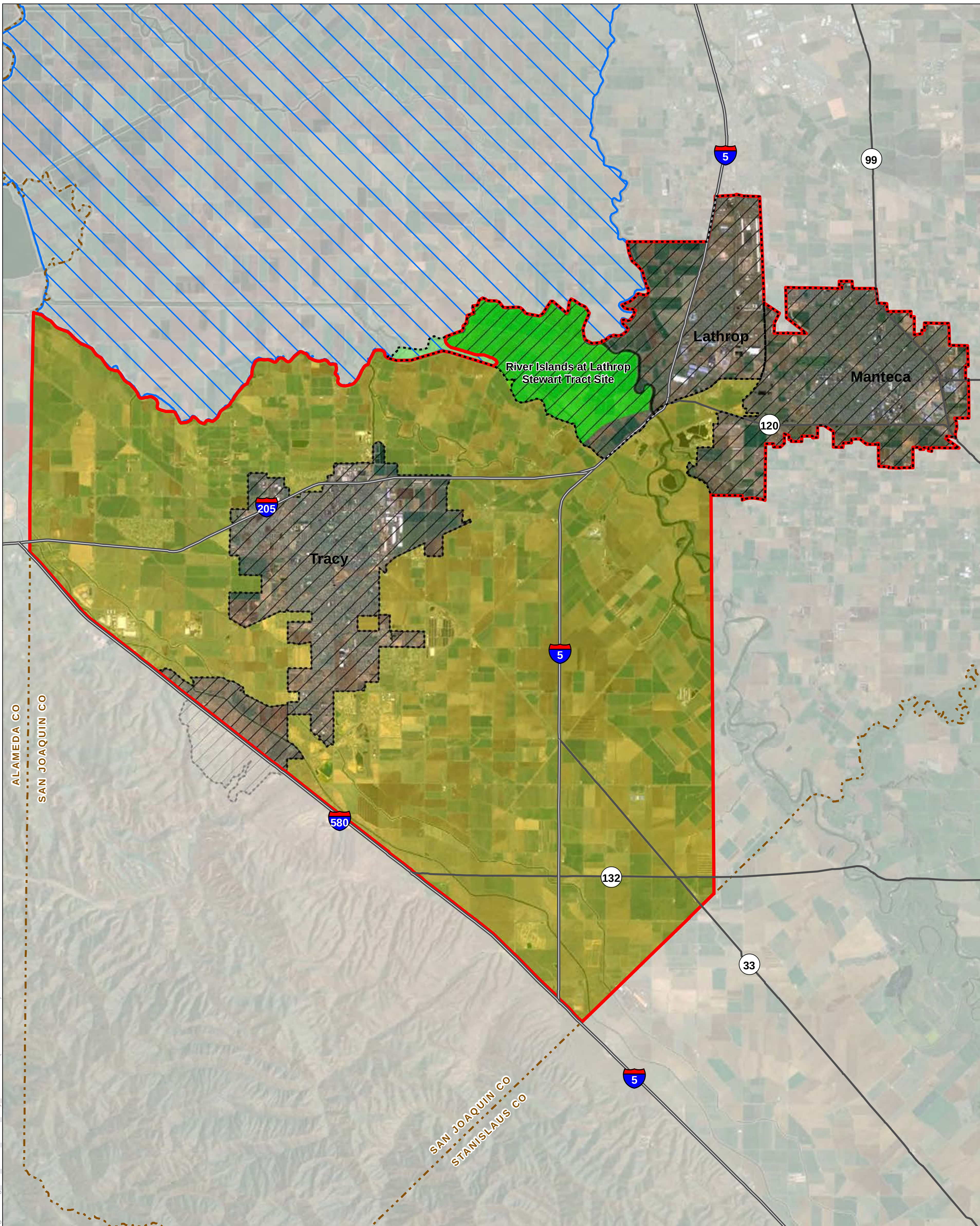
- at least 3,000 acres in extent,
- composed of contiguous parcels,
- regular and compact in shape, and
- not divided by I-5, I-205, SR 120, or SR 132.

Portions of the screening area that did not meet all of the above criteria were considered physically inappropriate to support an alternate site.

Step 2d Screening Methodology

Screening used ESRI ArcMap 9.2 to calculate acreages and to identify the boundaries of areas meeting the criteria above. The resulting polygons are referred to as the *focused screening areas*. All boundaries for focused screening areas were drawn along existing parcel boundaries.

Defining the boundaries of the focused screening areas required some judgment on the part of the GIS analyst. In particular, it was necessary to eliminate any tracts of land that would create a physically inappropriate shape (highly irregular, or with inholdings or narrow extensions). Focused screening areas were also precluded from spanning the physical barrier freeways and highways identified above—I-5, I-205, SR 120, or SR 132. Finally, any tracts of otherwise eligible land that were smaller than 3,000 contiguous acres were also removed from further consideration.



Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway

Focused Screening Area
Excluded--Within Existing City Limits

Current screening step shown in bold font.

August 2010

Figure 3-3
Areas Within City Limits -- Excluded From Further Consideration

N

0 0.5 1 2 3 4
Miles

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA

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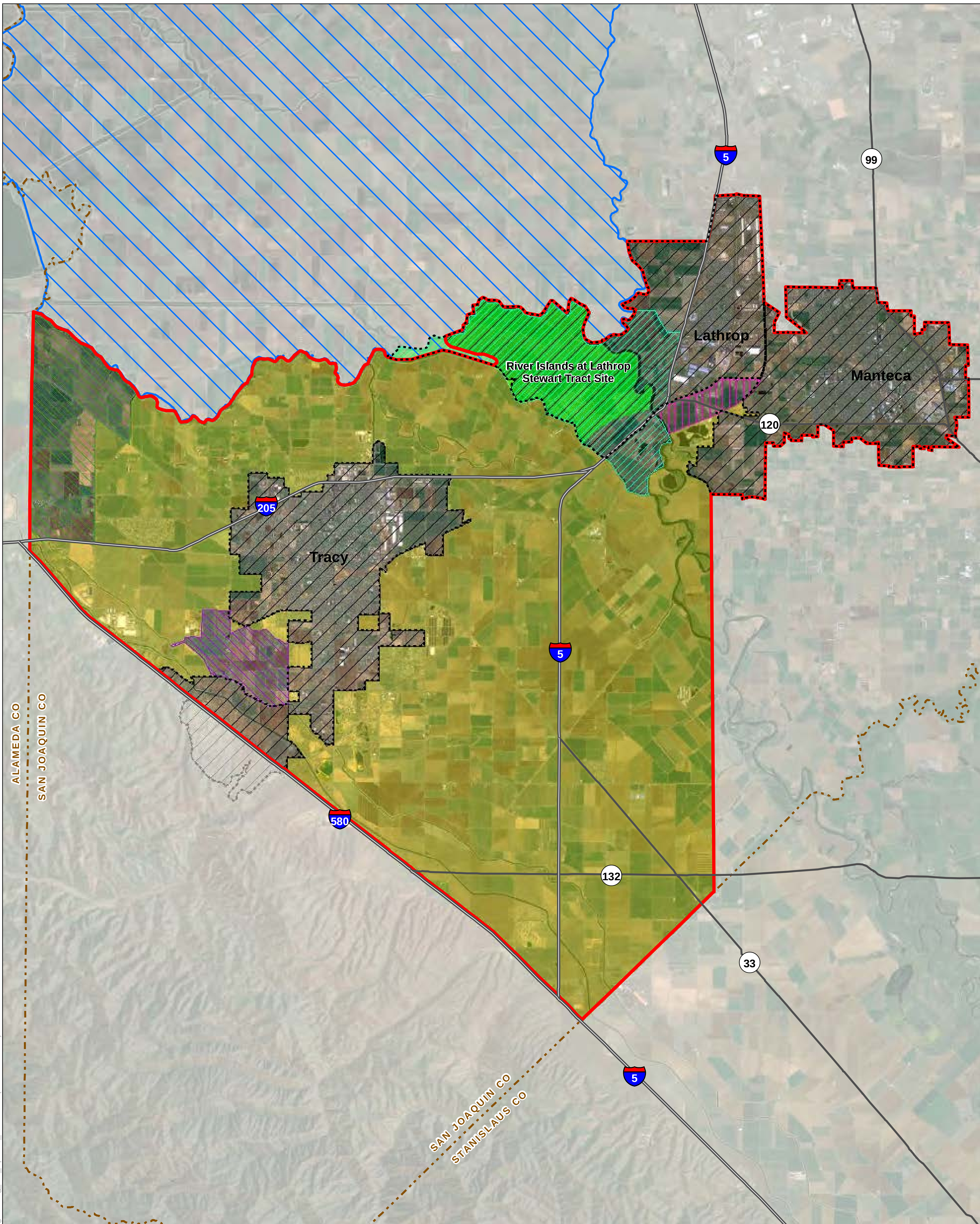

Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway

Focused Screening Area
Excluded--Within Existing City Limits

Excluded--West Lathrop Specific Plan
Excluded--South Schulte Specific Plan
Excluded--South Lathrop Specific Plan
Excluded--Mountain House Plans

Current screening step shown in bold font.

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Figure 3-4
Areas Covered by an Approved Specific Plan -- Excluded From Further Consideration

N

0 0.5 1 2 3 4
Miles

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA; County of San Joaquin

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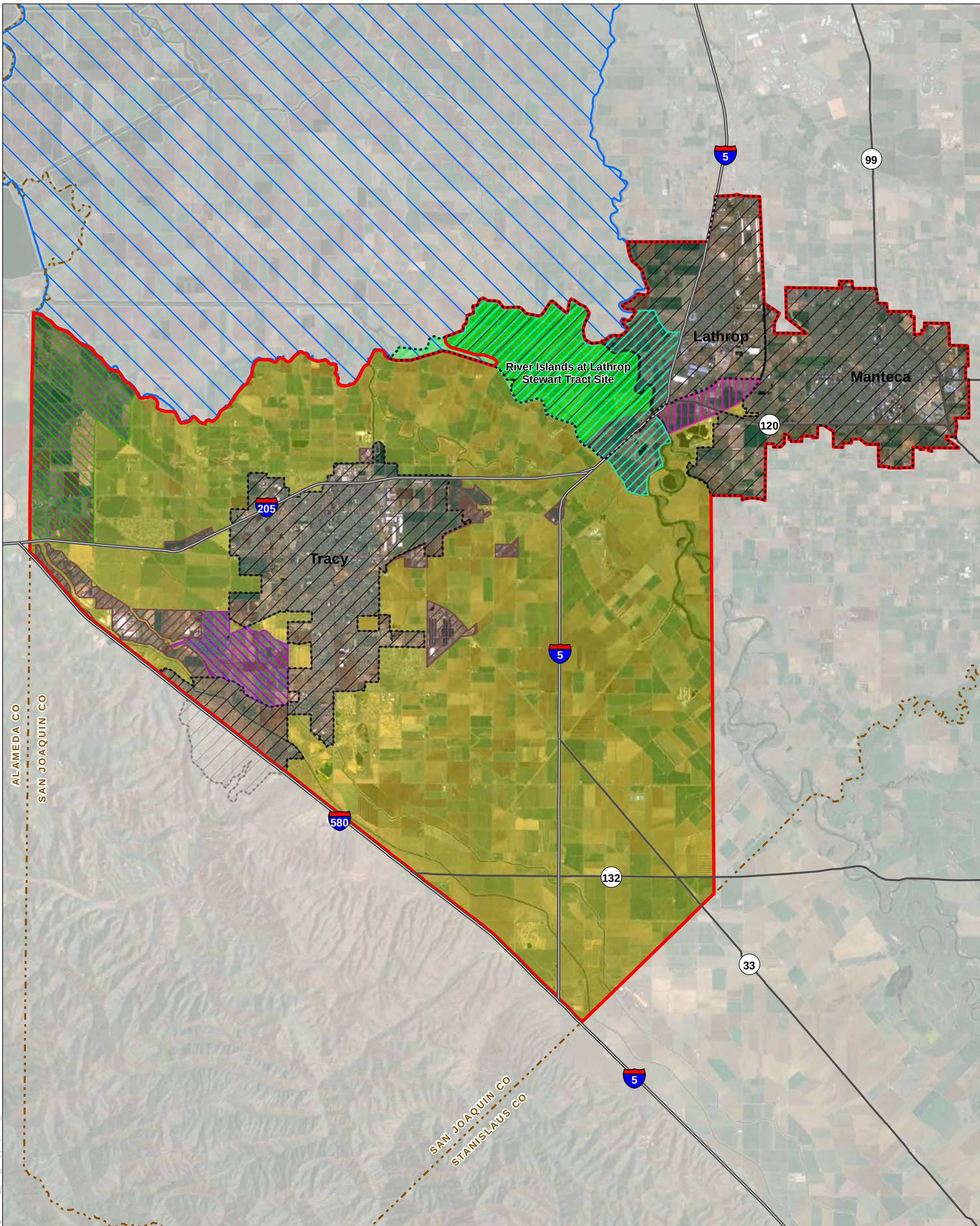

Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway
Focused Screening Area
Excluded--Within Existing City Limits
Excluded--West Lathrop Specific Plan
Excluded--South Schulte Specific Plan
Excluded--South Lathrop Specific Plan
Excluded--Mountain House Plans
Excluded--Inappropriate Land Uses

Current screening step shown in bold font.

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0 0.5 1 2 3 4
Miles

N

Figure 3-5
Areas Designates as Land Use Types Inappropriate for Planned Community -- Excluded From Further Consideration

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA; County of San Joaquin

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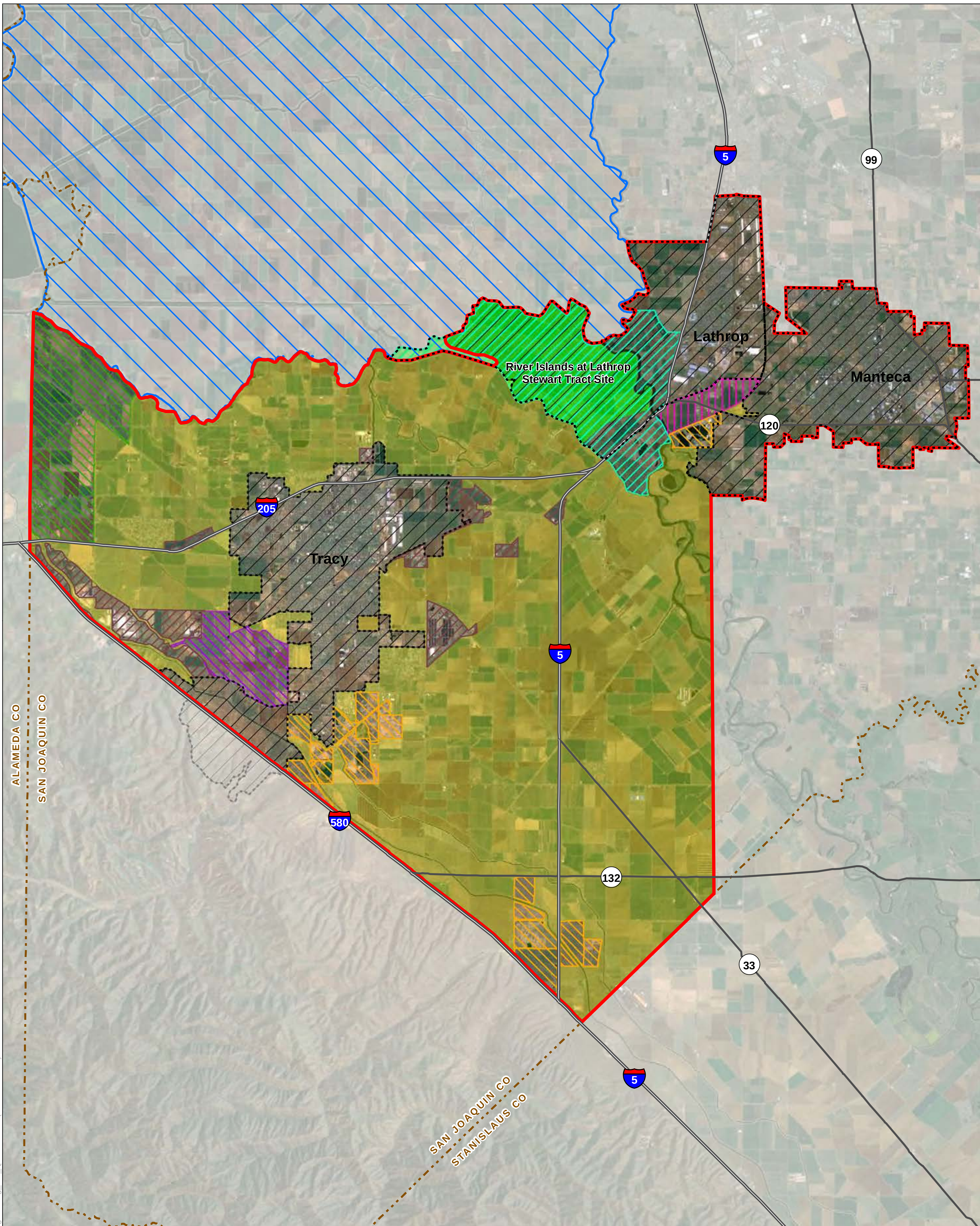

Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway

Focused Screening Area
Excluded--Within Existing City Limits

Excluded--West Lathrop Specific Plan
Excluded--South Schulte Specific Plan
Excluded--South Lathrop Specific Plan
Excluded--Mountain House Plans
Excluded--Inappropriate Land Uses
Excluded--Quarries

Current screening step shown in bold font.

August 2010

Figure 3-6
Quarries
-- Excluded From
Further Consideration

N

0 0.5 1 2 3 4
Miles

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA; County of San Joaquin

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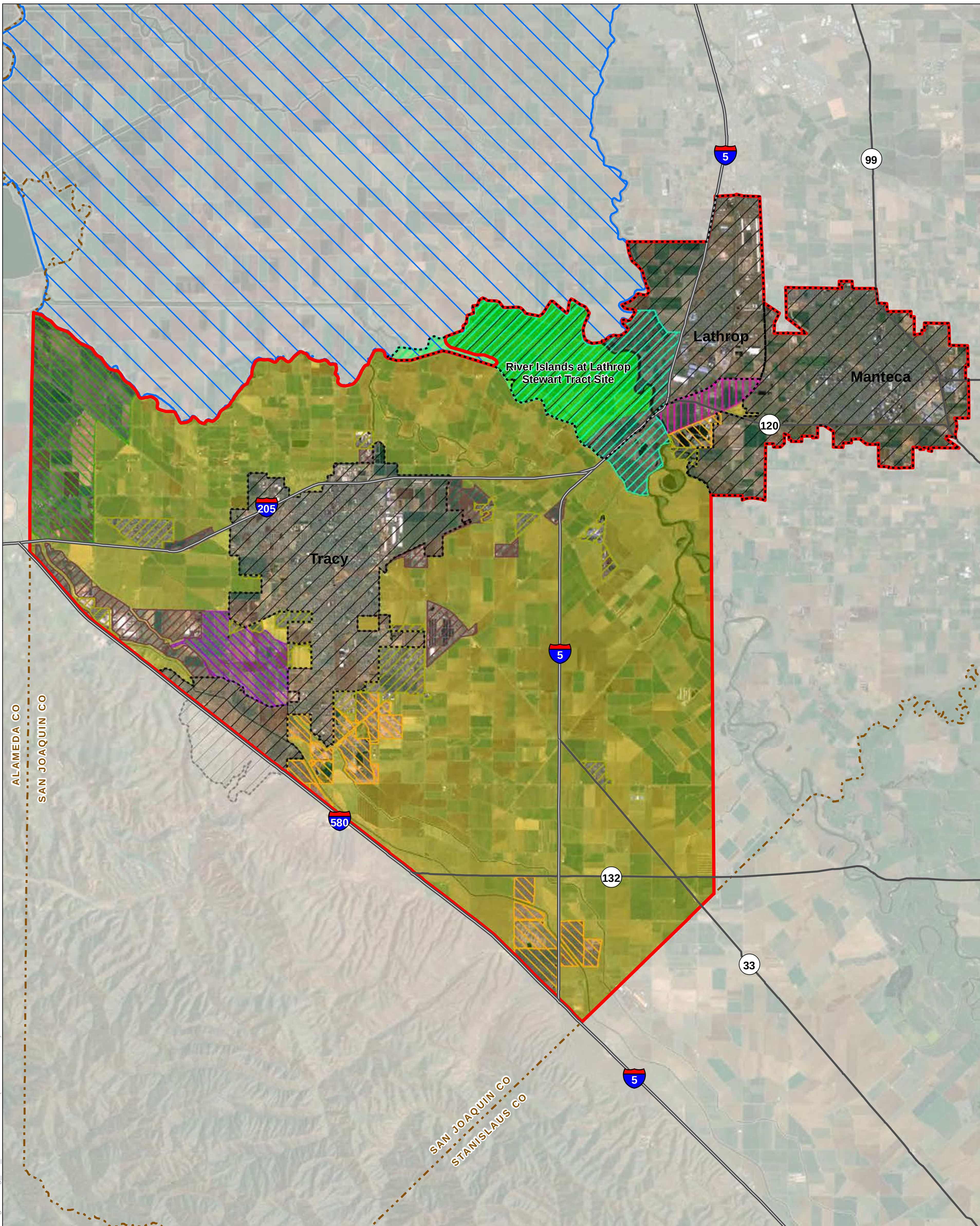
Path: K:\Projects_2\USACE\05044_05\mapdoc\AltSites\screening_20070907\NewLogo10\Fig_3-6_Quarries.mxd (KA 08-13-2010)



Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway

Current screening step shown in bold font.

August 2010

Focused Screening Area
Excluded--Within Existing City Limits

Excluded--West Lathrop Specific Plan
Excluded--South Schulte Specific Plan
Excluded--South Lathrop Specific Plan
Excluded--Mountain House Plans
Excluded--Inappropriate Land Uses
Excluded--Quarries
Excluded--Otherwise Under Grading or Development

Figure 3-7
Areas Otherwise Under Grading or Development -- Excluded From Further Consideration

N

0 0.5 1 2 3 4
Miles

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA; County of San Joaquin

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Path: K:\Projects_2\USACE\05044_05\mapdoc\AltSites\screening_20070907\NewLogo\10\Fig_3-7_ExcluDevo2.mxd (KA 08-13-2010)

Step 2d Results

Six focused screening areas (FSAs) were identified, ranging from 3,183 acres to 18,691 acres in extent (Figure 3-8). All focused screening areas are separated from each other either by land that was excluded in preceding steps or by a physical boundary, as follows.

- FSA-1 and FSA-6 are separated by I-205.
- FSA-3 and FSA-5 are separated by I-5.
- FSA-3 and FSA-4 are separated by SR 132.
- FSA-1 and FSA-2 are separated along the southern boundary by Tracy city limits, inappropriate land use, and existing development, and along the northern boundary by a waterway.

The following areas were excluded from further consideration because incorporating them into an alternate site would result in an inappropriate shape for a planned community, inholdings, or non-contiguous parcels.

- The areas between FSA-1 and I-205 that had not been excluded in prior steps.
- The area adjacent to FSA-3 west of SR 33, and adjacent to the developed area.
- The area north and west of FSA-3 and south and east of I-5.
- The area north of FSA-5 and south of I-205.

Step 2e—Land Ownership and Feasibility of Acquisition

The final phase of practicability screening addressed the feasibility of acquiring 3,000 or more contiguous acres within the focused screening areas.

Step 2e Assumptions

1. Acquisition of an alternate site would require the proponent to go through an options process.

   Source/Basis: Because it reduces financial risks by deferring outright purchase until lands are entitled for development, the options process is typical when a developer acquires lands that are not yet entitled or covered by an approved land use plan (e.g., Morrison, pers. comm., Dell'Osso pers. comm.). Earlier steps in the screening process were specifically designed to identify lands not already developed or slated for development; areas remaining in consideration at this point were assumed not to be entitled, so the options process would likely be the preferred approach to acquisitions.

2. Land acquisitions would be infeasible with too many sellers involved; screening should seek alternate sites whose acquisition would not involve an unreasonable number of sellers.

   Source/Basis: Discussion with acquisitions experts not involved in the project indicates that negotiating land acquisitions for development can be a long, complex process. This is particularly true where the parcels are not already entitled, because of the added complexity and uncertainty associated with the options process (Morrison pers. comm.). Although any acquisition is theoretically possible given sufficient time and funding, the complexity and difficulty of land acquisition would be expected to increase with the number of landowners involved, and acquisition of sufficient lands could ultimately become infeasible in practice with too many sellers (Morrison pers. comm.).

Because so many variables are involved, it is difficult to identify "how many is too many"—that is, the threshold number of landowners at which it would become impossible to negotiate acquisition of sufficient lands (3,000 acres or more) to support an alternate site (Morrison pers. comm.). Discussion with the proponent indicates that their experience with options processes involving two or three sellers has been complex and challenging. Based on this experience, in relation to the acreage needed, five landowners was tentatively identified as the maximum number that would be feasible for a project of this size and nature (Dell'Osso pers. comm.).

3. The same general shape criteria discussed for the preceding step apply in identifying sites potentially feasible for purchase; candidate alternate sites should be defined to minimize the number of parcel owners while maintaining an appropriately shaped parcel, consistent with criteria in *Parcel Size and Physical Characteristics* above.

   Source/Basis: See discussion under Step 2d for rationale behind parcel shape criteria.

Step 2e Criteria

- Candidate alternate sites should be owned by no more than five parties.
- Parcel shape should be consistent with criteria in *Parcel Size and Physical Characteristics* above: regular, compact, and without inholdings or other internal physical division.

Step 2e Screening Methodology

Screening used GIS data provided by the state of California to identify parcel ownership. Working in ESRI ArcMap 9.2, a GIS analyst used color-coding to display ownership information. Based on the ownership information, the analyst then searched for areas that met the Step 2d physical characteristics criteria and were owned by the fewest possible parties. As an interim screening step, 3,000-acre tracts with fewer than 20 owners were identified, and ArcMap 9.2 was used to define the boundaries of those sites.

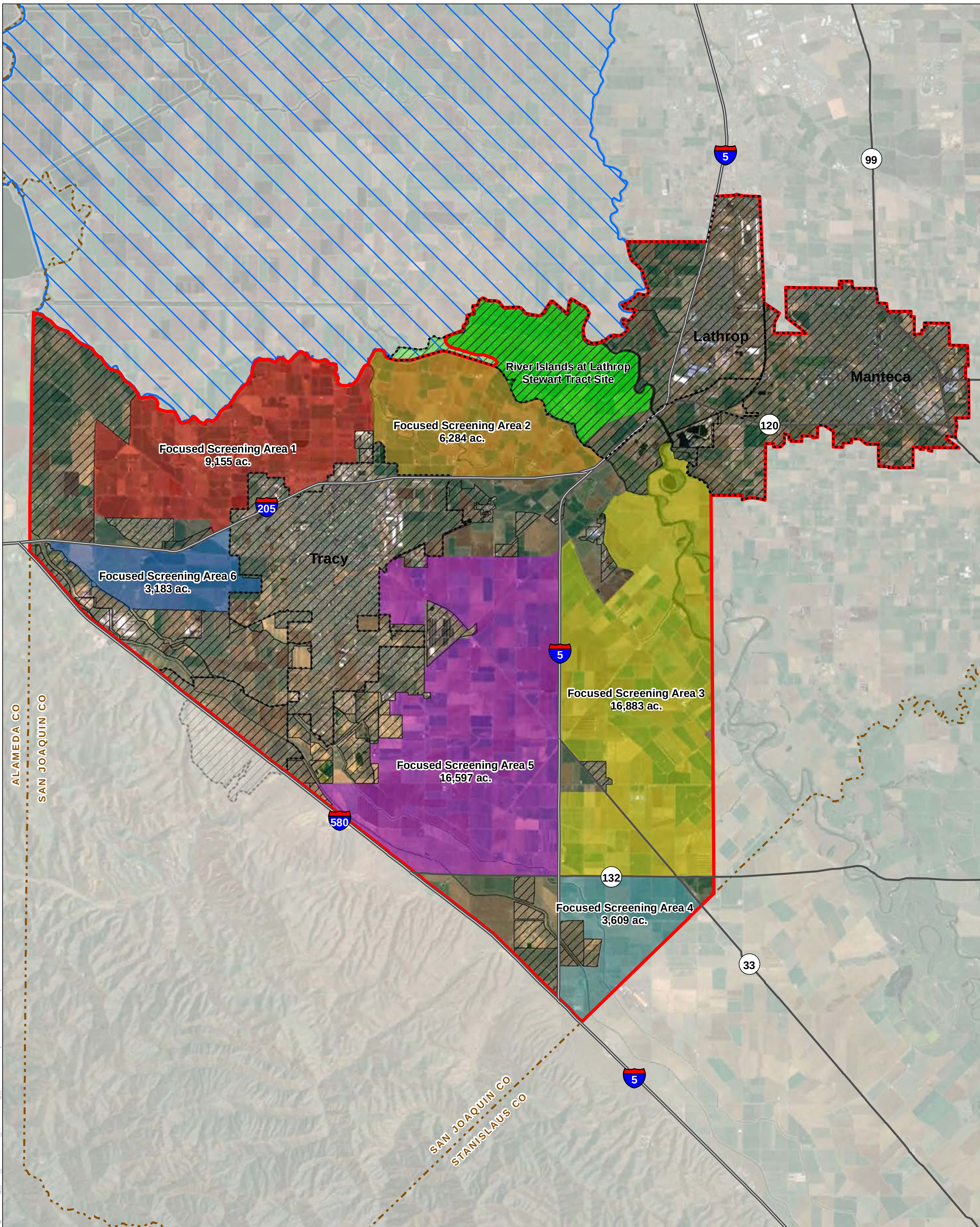
Step 2e Results

Six appropriately shaped sites comprising 3,000 acres or more, with 20 or fewer landowners, were identified: four east of I-5 and two west of I-5 near I-580 (Figure 3-9). For convenience, the sites are referred to by letter designations A through F. Table 3-3 shows the number of owners associated with each of the sites.

Table 3-3. Property Ownership, Sites A through F

Site	Number of Owners
A	12
B	11
C	7
D	6
E	13
F	20

As shown in Table 3-3, none of the candidate alternate sites has less than five owners (tentatively identified as the maximum number that would be feasible for option negotiations). Sites A, B, E, and



Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway

All Excluded Areas

Focused Screening Area 1
Focused Screening Area 2
Focused Screening Area 3
Focused Screening Area 4
Focused Screening Area 5
Focused Screening Area 6

Current screening step shown in bold font.

August 2010

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Figure 3-8
Focused Screening Areas

N

0 0.5 1 2 3 4
Miles

Sources: California Spatial Information Library
California Dept. of Fish & Game, Delta Protection Commission;
AirPhoto USA; County of San Joaquin

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F all exceed the five-owner threshold by a substantial margin and were eliminated on this basis. Sites C (7 landowners) and D (6 landowners) are much closer to the threshold. Because the threshold is tentative rather than absolute, these sites were identified as warranting closer examination. Further evaluation of Sites C and D focused on ability to meet all portions of the basic project objective and project purpose and need, in addition to feasibility of acquisition.

As shown in Figure 3-9, Site C is located adjacent to and astride the east boundary of the screening area, east of I-5. Site D is partially contiguous with Site C, and is also located at the east boundary of the screening area, east of I-5 (Figure 3-9). Both sites are immediately east of the unincorporated New Jerusalem rural community, and both comprise lands within "Alternative 6 (New Jerusalem)" discussed in the proponent's 404[[b][1] materials (River Islands 2006), although neither is entirely coterminous with the proponent's Alternative 6. Both sites are currently in agriculture and are surrounded by agricultural lands.

Sites C and D are both appropriately located to satisfy the basic project objective of

> construct[ing] a large-scale, mixed-use project consisting of residential development and a commercial complex … located in San Joaquin County or the south Delta area.

They would also have the potential to satisfy the portions of the project purpose and need that are regionally focused:

- "… providing additional housing for workers employed in the Tri-Valley area of southern Alameda and Contra Costa Counties," and
- "… offsetting the jobs deficit in San Joaquin County … and offering a local employment nexus to relieve the current pressure to commute into the San Francisco Bay Area."

However, the closest edges of Sites C and D are located about 5 miles from the current urban growth boundary of the City of Lathrop, and the sites are separated from the City by undeveloped agricultural lands. Consequently, neither site is well situated to meet the need for a project that would

- "[offer] additional housing diversity not currently available in the City of Lathrop," and
- "[foster] economic and employment development in the City of Lathrop."

Because Sites C and D are surrounded by agricultural lands and are several miles from the closest urban growth limits (those of Tracy and Lathrop; Figure 3-9), large-scale mixed-use construction at either site would create a new, geographically isolated development center. This would be inconsistent with the County General Plan, which assumes that Lathrop-related growth will occur "within the City" (County of San Joaquin 1992 p.IV-6), and would also create a potential nucleation point for leapfrog growth.

Moreover, recent land use planning in this part of the County has been complex and contested. The existing 142-acre rural community of New Jerusalem grew out of land divisions during the 1960s and '70s, with the original framework augmented by later infill, rising to a total of 192 dwellings as of 1990 (County of San Joaquin 1992 Vol. II p. XII-28).

New Jerusalem was initially designated as a "new town" growth center in the County's 1991 General Plan update. Under this scenario, New Jerusalem would have expanded to slightly more than 3,000 acres at buildout, but some landowners in the New Jerusalem area sued to keep their lands out of development planning (River Islands 2006; see also 47 Cal. App. 4th 29, No. C020235, at http://ceres.ca.gov/ceqa/cases/1996/koster.html). The County subsequently removed the "new town" designation, and the current County General Plan envisions that New Jerusalem will remain a rural community with minimal growth (277 dwellings projected in 2010, the current General Plan planning horizon) (County of San Joaquin 1992 Vol. II p. XII-31).

Given the history of opposition to development planning in this area, acquisition of sufficient lands to accommodate a 3,000-acre development is considered unlikely to be feasible. Even if sufficient acreage were acquired, Sites C and D are geographically inappropriate to satisfy all portions of the project purpose and need; further analysis of either site would serve only to create a "straw man" alternative. For these reasons, both sites were eliminated from further consideration.

Step 3—Preliminary Evaluation of Environmental Outcomes, Offsite Alternatives

Step 3 was intended to evaluate potential alternate sites for their environmental sensitivity (i.e., the potential for adverse environmental effects resulting from construction of a project like proposed Phase 2B), focusing on three key parameters:

- extent of wetlands and other waters,
- flood risk and related hazards, and
- known use by listed species and/or presence of designated critical habitat.

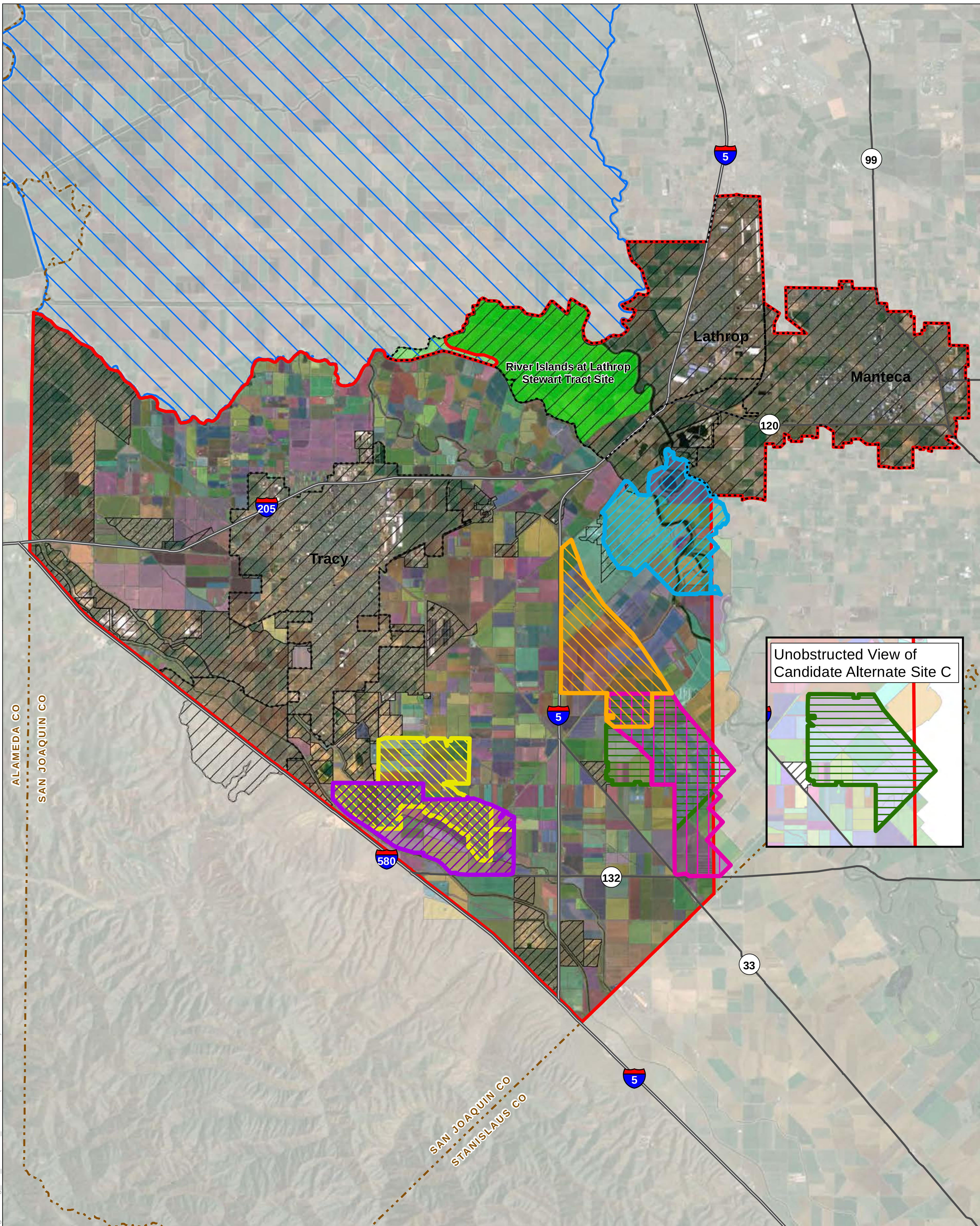
Candidate alternate sites were to be compared and ranked, in order to eliminate the least suitable/least promising site or sites. However, because no practicable candidate sites were identified in Step 2, Step 3 was not carried out.

Additional Offsite Proposal—NRDC Settlement and LSRRFB

During the development of this alternatives analysis, the proponent reached a settlement agreement with groups that had filed a lawsuit against the City's EIR for the project, including the Natural Resources Defense Council (NRDC), Natural Heritage Institute (NHI), California Sportfishing Protection Alliance, and the Deltakeeper Chapter of San Francisco Baykeeper. As part of the settlement, River Islands agreed to request that the Corps evaluate a flood bypass for the lower San Joaquin River, referred to as the Lower San Joaquin River Regional Flood Bypass or LSRRFB (River Islands at Lathrop 2008a p.1).

The LSRRFB proposal assumes construction of the River Islands Phase 2B improvements to Paradise Cut. As of October 2008, hydraulic analyses and conceptual design for the LSRRFB itself are still in process, but in general this project would construct additional flood protection improvements to divert floodflows from the San Joaquin River, transferring them to an improved downstream portion of Paradise Cut and eventually into Grant Line Canal. Additional flood storage may also be provided (River Islands at Lathrop 2008b p.1).

The stated purpose of the LSRRFB is to "alleviate flooding conditions along the Lower San Joaquin River" (River Islands at Lathrop 2008b p. 1). As described to date, it focuses entirely on flood



Screening Area Boundary
Primary Delta
City Limits
County Line
Interstate
State Highway

All Excluded Areas

Current screening step shown in bold font.

Candidate Alternate Sites

- A -- 3,177 acres
- B -- 3,110 acres
- C -- 3,098 acres
- D -- 3,374 acres
- E -- 3,102 acres
- F -- 3,031 acres

Parcel Ownership
(various colors)

Figure 3-9
Candidate Alternate Sites
and Parcel Ownership

N

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Miles

August 2010

Sources: California Spatial Information Library California Dept. of Fish & Game, Delta Protection Commission; AirPhoto USA; County of San Joaquin

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protection and does not include a development component. The LSRRFB would not satisfy either the basic project objective or the project purpose and need, and therefore is not relevant to this alternatives analysis; if introduced into alternatives screening, it would be eliminated at Step 1, which evaluated consistency with the basic project objective. Consequently, the LSRRFB will not be discussed further in this document, although the Corps may agree to include it as a future project in the EIS analysis of cumulative effects.

Outcomes—Offsite Alternatives

Screening did not identify any feasible alternate project sites. Portions of the screening area passed the initial screening steps used to evaluate the suitability of offsite lands as alternate project sites, but GIS analysis of parcel ownership data for these areas failed to identify any parcels that are large enough to provide a viable alternate site, feasibly obtainable, and appropriately located to satisfy all parts of the project purpose and need. Because no suitable, practicable alternate site has been identified, no offsite alternatives identified through the screening process are recommended for EIS analysis.

Chapter 4
Screening Process and Outcomes, Onsite Alternatives

The process used to develop onsite alternatives entailed

1. identifying the aspects of proposed Phase 2B that would impact aquatic resources, and
2. developing conceptual approaches (project modifications) to reduce or avoid impacts while still satisfying the basic project objective.

Conceptual approaches then underwent a preliminary screening-level evaluation for their potential to affect non-aquatic environmental resources, with the intent of eliminating any that could result in unacceptable outcomes such as greatly increased effects on listed species. Finally, the remaining conceptual approaches—which included all of those originally proposed, since none were ruled out on environmental grounds—were combined into more comprehensive onsite alternatives.

Using this methodology, onsite alternatives development principally involved identifying ways to reduce or eliminate the specific project elements that would affect aquatic resources. Reduced development densities were not considered, because reduced density alone would not remove the project elements expected to affect aquatic resources. Reduced and modified development footprints were considered, but only as they offered the potential to avoid specific aquatic resources effects associated with proposed Phase 2B. Reduced footprints were assumed to require increased density to ensure an economically viable community.

Development of onsite alternatives was restricted to proven, conventional construction techniques. Approaches such as eliminating the flood protection component and constructing anchored structures designed to float on floodwater, such as those being explored in the Netherlands (see Edidin 2005, Palca 2008), were rejected as unlikely to be marketable on a large scale in this area. Eliminating the flood protection component and relying on "flood-resistant construction" with living spaces confined to upper stories, per recent building codes (e.g., ICBO 2001), was also considered unlikely to be marketable on a large scale, and was thus eliminated as economically impracticable.

The No Action Alternative, Phase 2B with construction of an interior levee system, was determined to meet the basic project objectives and thus was included for further consideration under Section 404[b][1]. As discussed in Chapter 5, it will be carried forward for EIS analysis as required by NEPA and implementing regulations.

The approach used to develop onsite alternatives is broadly consistent with the Environmental Constraints (50% Development) Alternative analyzed in the City's SEIR and Addendum for River Islands at Lathrop (City of Lathrop 2003, 2005). However, alternatives development for the present analysis used updated project description information from the project BAs (EDAW 2005a, 2005b) and the draft project description being prepared to support the Corps EIS for River Islands Phase 2B. It also incorporated input on potential approaches from the proponent's permit application materials (River Islands 2006 pp. 68–89).

As summarized in Chapter 1, proposed Phase 2B's principal impacts on aquatic resources would be associated with

- construction of the new Lathrop Landing back bay;

- construction and use of boat docks along jurisdictional waterways that bound the Stewart Tract site;
- modifications to Paradise Cut for flood protection and habitat restoration; and
- fill of the existing ditch and pond internal to the Stewart Tract.

Focusing on these four general aspects of the project, alternatives development identified the following conceptual approaches for onsite alternatives.

- Approach 1—Phase 2B with No Lathrop Landing Back Bay.
- Approach 2—Phase 2B with Lathrop Landing as an Internal (Non-Jurisdictional) Feature.
- Approach 3—Phase 2B with Reduced or Eliminated Boat Docks on San Joaquin River, Old River, and/or Paradise Cut.
- Approach 4—Phase 2B with Modified Flood Protection (No Modification to Paradise Cut, Expanded Setback Levees).
- Approach 5—Phase 2B with Avoidance and Protection of Ditch and Pond.
- Approach 6—No Action Phase 2B with Construction of an Internal Levee System.

Any of these approaches could be used independently, or these strategies could be combined and/or modified to develop an approach that best addresses impacts on aquatic resources while meeting the needs of the City and Tri-Valley commuters. The following section discusses each approach in more detail. Because the development of onsite alternatives was confined to proven, conventional construction techniques, these approaches were assumed to be practicable, and practicability is not addressed further in this chapter. Discussions of non-aquatic environmental effects are intended to be preliminary and general, and will be superseded by EIS analysis for all alternatives carried forward.

Alternate Onsite Approaches

Approach 1—Phase 2B with No Lathrop Landing Back Bay

Onsite Approach 1 would eliminate the proposed Lathrop Landing back bay embayment in the Town Center area. Jurisdictional impacts associated with Lathrop Landing are shown in Table 4-1.

Table 4-1. Corps-Regulated Effects Associated with Lathrop Landing

Activity	Approximate Acreage of Effect on Jurisdictional Areas
Dredging of San Joaquin River for Lathrop Landing back bay entrance	0.414 acres conversion to other waters
Cut for levee breach for Lathrop Landing back bay entrance	0.263 acres conversion to other waters
Maintenance dredging of Lathrop Landing back bay	Additional temporary disturbance in some years

Source: River Islands in prep.

Under Approach 1, there would be no breach of the project levee, no need to dredge an entrance to Lathrop Landing, and no maintenance dredging for boating access. The land that would have been converted to a back bay would be available for upland construction or open space use, with or without upland habitat restoration.

Aquatic Resources Impacts

Approach 1 would have the potential to reduce permanent loss and conversion impacts on aquatic resources by as much as about 0.7 acre (i.e., the approximate footprint of the portions of Lathrop Landing back bay within jurisdictional habitat, if constructed). Approach 1 would also avoid repeated disturbance impacts for maintenance dredging.

Eliminating the Lathrop Landing back bay would have the potential to avoid both temporary and permanent effects on listed aquatic species and their habitat associated with this feature, including effects on San Joaquin River water quality. This could translate to a slight reduction in short- and long-term effects special-status fish species and their habitat.

Other Environmental Effects

Approach 1 would have the potential to reduce effects associated with construction earthwork, including dust generation and tailpipe emissions. Depending on the overall cut/fill balance with Lathrop Landing excavation eliminated from the construction process, Approach 1 could also require the use of import fill, entailing additional haulage and concomitant traffic, air quality, and noise impacts. Depending on how the land was used, Approach 1 might have potential to reduce or avoid impacts on upland wildlife and plants, although some designs might increase these effects.

Approach 2—Phase 2B with Lathrop Landing as an Internal (Non-Jurisdictional) Feature

Under onsite Approach 2, Lathrop Landing would be constructed in the same location described for proposed Phase 2B, but as part of the internal water system rather than as a back bay connected to the San Joaquin River. The existing project levee would not be breached. As an internal feature, Lathrop Landing could be connected to the Central Lake via a canal. Depending on design, it might be necessary to install an outfall structure or structures to manage water level in an internal Lathrop Landing feature, similar to the proposed design for the Central Lake. All other project components would remain as proposed.

Aquatic Resources Impacts

Like Approach 1, Approach 2 would have the potential to reduce permanent loss and conversion impacts on aquatic resources by as much as about 0.7 acre (the jurisdictional footprint of the Lathrop Landing back bay). It would also avoid repeated disturbance impacts for maintenance dredging.

Constructing Lathrop Landing as an internal water feature rather than an exterior back bay would have the potential to avoid most or all of the proposed Lathrop Landing's permanent and temporary effects on listed species and their habitat in the San Joaquin River. This could translate to a slight reduction in short- and long-term effects on listed fish species and their habitat. If the back bay were provided with an external outfall to manage water levels, some ongoing effect on water quality and aquatic habitats would be possible.

Other Environmental Effects

Approach 2 would avoid air quality, noise, and visual effects associated with dredging to connect Lathrop Landing to the San Joaquin River. It would also avoid intermittent long-term noise and air quality effects associated with the dredging needed to maintain the connection between the back bay and the River. However, an internal back bay feature would likely require some level of maintenance, with potential noise and air quality effects due to the use of power equipment.

Approach 3—Phase 2B with Reduced or Eliminated Boat Docks on San Joaquin River, Old River, and/or Paradise Cut

As proposed, Phase 2B would include group docks providing as many as 675 new boat berths. Docks would be associated with a group of shoreline residential parcels and most if not all would be installed when the homes are built, if requested by the homeowners. The number of docks proposed—and thus the extent of dock-related impacts—is currently in flux as discussions with resource agencies proceed.

Onsite Approach 3 would reduce or eliminate boat docks on the jurisdictional waterways that bound the Stewart Tract site. Otherwise, all constructed water features would remain the same.

Aquatic Resources Impacts

Approach 3 would have the potential to reduce or avoid the following aquatic resources impacts associated with proposed Phase 2B, summarized in the draft biological assessments (BAs) prepared for the project (EDAW 2005a pp. 111–128) and follow up discussions with resource agencies (Jones & Stokes file information).

- Dock construction effects on water quality, including potential increases in turbidity, reduced dissolved oxygen levels, and inadvertent spills or releases of contaminants such as fuels.
- Noise and vibration disturbance related to ongoing use and maintenance of the docks
- Water quality effects of dock use resulting from incidental releases of fuels and oil.
- Dock-related shading effects; potential creation of refugia for nonnative predator fishes, which could reduce the quality/usability of river habitat for native species.

Other Environmental Effects

Reducing or eliminating dock construction could slightly reduce the need for materials deliveries to Stewart Tract, potentially decreasing traffic, air quality, and noise effects associated with haulage. To the extent docks are identified as visually intrusive elements in the River viewscape, reducing or eliminating them could also reduce or avoid long-term visual impacts.

Approach 4—Phase 2B with Modified Flood Protection (No Modification to Paradise Cut, Expanded Setback Levees)

Onsite Approach 4 would eliminate all modifications to Paradise Cut. Instead, to provide the needed flood protection upgrades, an internal setback levee would be built.

Corps-regulated impacts associated with proposed Phase 2B modifications to Paradise Cut are shown in Table 4-2.

Table 4-2. Corps-Regulated Effects Associated with Modifications to Paradise Cut

Activity	Approximate Acreage of Effect on Jurisdictional Areas
Fill of pond and associated habitat during construction of Paradise Cut setback levee	2.98 acres permanent loss
Excavation of wetland for lowering of bench near Paradise Weir	15.24 acres temporary disturbance, to be restored to previous condition
Dredging to confluence of Old River and Paradise Cut to connect canal to river	0.03 acre permanent loss; 0.25 acre conversion to other waters
Breaching of existing Paradise Cut levee after new levee completion	6.48 acres conversion to other waters
Fill for installation of riparian brush rabbit crossings connecting Paradise Cut islands	0.04 acre permanent loss
Maintenance dredging of Paradise Cut Canal (every 5 to 10 years)	Additional temporary disturbance in some years

Source: River Islands in prep.

Aquatic Resources Impacts

Approach 4 would have the potential to avoid permanent loss and conversion effects on as much as about 10 acres of jurisdictional habitat, and temporary effects on as much as about 15 acres, based on the footprint of the activities and features described for proposed Phase 2B.

Approach 4 would eliminate the habitat benefits anticipated as a result of restoration and enhancement under Phase 2B as proposed. Approach 4 would also eliminate or very substantially curtail the use of Paradise Cut to provide onsite mitigation for any loss of jurisdictional habitat internal to Stewart Tract during Phase 2B.

Other Environmental Effects

Approach 4 would have the potential to eliminate proposed Phase 2B's potential direct effects on giant garter snake, riparian brush rabbit, and CNPS-listed plants (Delta button celery, slough thistle, and Wright's trichocoronis) in the Paradise Cut area. Approach 4 would also have the potential to eliminate the air quality, noise, traffic, and visual effects associated with earthwork to construct the flood protection and habitat features proposed for Paradise Cut. However, construction of the Approach 4 setback levee would entail similar types of effects. Whether Approach 4's construction-related effects would be increased or decreased by comparison with proposed Phase 2B would depend on comparative earthwork volumes and construction duration.

Since Paradise Cut habitats would not be restored or enhanced under Approach 4, this approach would eliminate any aesthetic and habitat value benefits associated with these activities.

Approach 5—Phase 2B with Avoidance and Protection of Ditch and Pond

Under onsite Approach 5, the central drainage ditch and pond would be avoided. This could require increased development density in the eastern portion of the Stewart Tract site, potentially including some multi-story development. The central ditch and pond would be protected from the effects of nearby concentrated development by a no-development buffer zone. The buffer would likely need to extend at least 100 feet wide on either side of the feature, consistent with general standards of the California Department of Fish and Game, and probably considerably wider, depending on development density and layout. The buffer could offer an opportunity for limited restoration of upland habitat, or it could be landscaped as a visual amenity. It could also be designed to incorporate stormwater treatment features.

The effects of proposed Phase 2B associated with the fill and conversion of the central drainage ditch and the pond are shown in Table 4-3.

Table 4-3. Corps-Regulated Effects Associated with Central Drainage Ditch and Pond

Activity	Approximate Acreage of Effect on Jurisdictional Areas
Central drainage ditch converted to Inner Lake	4.49 acres conversion to other waters
Central drainage ditch converted to Paradise Cut waters	0.36 acre conversion to other waters
Fill/excavation of central drainage ditch as borrow material for levees and associated habitat	6.36 acres permanent loss
Fill of pond and associated habitat during construction of Paradise Cut setback levee	2.98 acres permanent loss

Source: River Islands in prep.

Aquatic Resources Impacts

Approach 5 would have the potential to avoid permanent loss and conversion effects on as much as about 14 acres of jurisdictional habitat, based on the footprint of activities and features described for proposed Phase 2 B. It would also offer the opportunity to restore or enhance habitat in the central drainage ditch, the pond, and potentially also on the northwestern portion of Stewart Tract, since development would have a less extensive footprint. However, surrounding the ditch and pond with developed areas could also limit their long-term habitat value.

Because the central drainage ditch and pond are not connective with external jurisdictional waters except via the existing tailwater discharge, and do not support habitat for listed fish species, Approach 5 would not reduce or avoid effects on these species by comparison with proposed Phase 2B.

Other Environmental Effects

Approach 5 would alter the cut/fill ratio by comparison with proposed Phase 2B, and would likely alter traffic, air quality, and noise impacts. These could either increase or decrease, depending on whether import fill or offsite disposal is needed.

The central drainage ditch provides some of the only "[p]otentially suitable habitat" for giant garter snake on Stewart Tract (EDAW 2005b p. 8-23). Avoiding changes to the central drainage ditch would have the potential to reduce or eliminate any direct adverse effects on the giant garter snake from habitat conversion. Over the long term, habitat restoration in the buffer zones, ditch, and pond would have the potential to offer some benefit to giant garter snake, if connectivity with potentially suitable habitat in Paradise Cut could be provided. Restoration in these areas could also benefit Delta button celery, slough thistle, and Wright's trichocoronis. However, the long-term benefit of a habitat "island" surrounded by dense development could be limited.

Approach 6—No Action Phase 2B with Construction of an Internal Levee System

Onsite Approach 6, No Action Phase 2B with Construction of an Internal Levee System, would implement a version of Phase 2B that would not require federal review and permitting under CWA Section 404 or federal review and approval under 33 USC Section 408 and Section 10 of the Rivers and Harbors Act. River Islands Phases 1 and 2A are already under construction under local and state authorization, so the No Action Approach is assumed to include completion of the following Phase 1 and Phase 2A components of River Islands at Lathrop, along with a slightly smaller (approximately 20 acres) Phase 2B. The major differences between Approach 6 and proposed Phase 2B would be the lack of PCIP improvements (e.g., setback levees, lowered bench, high-ground refugia); an internal levee system rather than the use of super-levees; and the lack of waterside vegetation on project levees along the San Joaquin and Old Rivers.

Under Approach 6, there would be no modification, breach or improvements to federal project levees, no need to dredge an entrance to Lathrop Landing, no maintenance dredging for boating access, no installation of group boat docks, and no earthwork that would modify jurisdictional waters. Regional flood protection benefits, as well ecosystem restoration and enhancement activities associated with the PCIP and shaded aquatic habitat plantings would not be realized under this approach.

Aquatic Resources Impacts

Approach 6 would not result in temporary or permanent impacts on aquatic resources as the approach does not include modifications to federal project levees or an action that would modify jurisdictional waters.

Other Environmental Effects

Approach 6 would likely result in similar impacts on non-aquatic environmental resources (e.g., air quality, noise, transportation, etc.) as those associated with Phase 2B. Approach 6 would eliminate or reduce impacts on special-status fish, wildlife and plant species given the approach's reduction of impacts on jurisdictional waters and federal project levees. However, the environmental benefits associated with the regional flood protection, as well as the ecosystem restoration and enhancement activities associated with the proposed PCIP and shaded riverine aquatic habitat plantings would not be realized under this approach.

Potential to Combine Approaches—Onsite Alternatives Development

For each of the approaches described above, Table 4-4 summarizes the potential to reduce impacts on aquatic resources, the type of aquatic resources involved, and the area that would remain available for development. Combining multiple approaches would allow greater reduction in impacts, as well as the potential to address more than one kind of impact (wetlands, open water, habitat for listed species) under a single approach.

Table 4-4. Overview of Onsite Impact Reduction Approaches

Approach	Maximum Reduction in Impacts (Acres)[1]	Functions and Values Addressed[2]
1—Phase 2B with No Lathrop Landing Back Bay	0.7	Fisheries/inchannel habitat
2—Phase 2B with Lathrop Landing as an Internal (Non-Jurisdictional) Feature	0.7	Fisheries/inchannel habitat
3—Phase 2B with Reduced or Eliminated Boat Docks on San Joaquin River, Old River, and/or Paradise Cut	Design-dependent	Fisheries/inchannel habitat
4—Phase 2B with Modified Flood Protection (No Modification to Paradise Cut, Expanded Setback Levees)	10	Fisheries/inchannel habitat, wetlands
5—Phase 2B with Avoidance and Protection of Ditch and Pond	14	Inland waters, minor wetland area associated with pond
6—No Action Phase 2B with Construction of an Internal Levee System	37.2	Fisheries/inchannel habitat, wetlands, inland waters, pond

[1] Aquatic resources; includes permanent loss and conversion impacts.

[2] Sycamore Environmental Consultants 2004.

As a stand-alone alternative, Approach 6 would eliminate impacts to jurisdictional habitat and was not identified as having preclusory impacts on other resources during the preliminary screening-level assessment. Approaches 4 and 5 would offer the next level of potential reduction in permanent loss and conversion of jurisdictional habitat, and neither was identified as having preclusory impacts on other resources. However, neither Approach 4 nor Approach 5 would offer complete avoidance of aquatic resources impacts. Combining Approaches 4 and 5 would substantially increase the potential to avoid aquatic resources impacts, while addressing the greatest diversity of aquatic resources. Accordingly, the following alternatives will be carried forward for EIS analysis.

- Alternative 1 (Approach 4 stand-alone)—Phase 2B with Modified Flood Protection.
- Alternative 2 (Approach 5 stand-alone)—Phase 2B with Protection of Inland Waters.
- Alternative 3 (Approaches 4 and 5 combined)—Phase 2B with Modified Flood Protection and Protection of Inland Waters.
- No Action Alternative

Figure 4-1 shows the approximate area available for development under Alternatives 1, 2, 3, and No Action.

The approaches that omit or modify the Lathrop Landing back bay offer substantially less potential to reduce aquatic resources impacts. Therefore, these approaches will not be carried forward for separate analysis in the EIS, and because they would offer little additional benefit are not proposed for analysis in combination with Approach 4 and/or 5. However, based on discussions with the U.S. Fish and Wildlife Service to date, it is the Corps' understanding that there is some concern about the impact of dock structures on listed fishes. Therefore, further modification of the proposed number or location of dock structures may occur as an outcome of consultation under the Endangered Species Act.

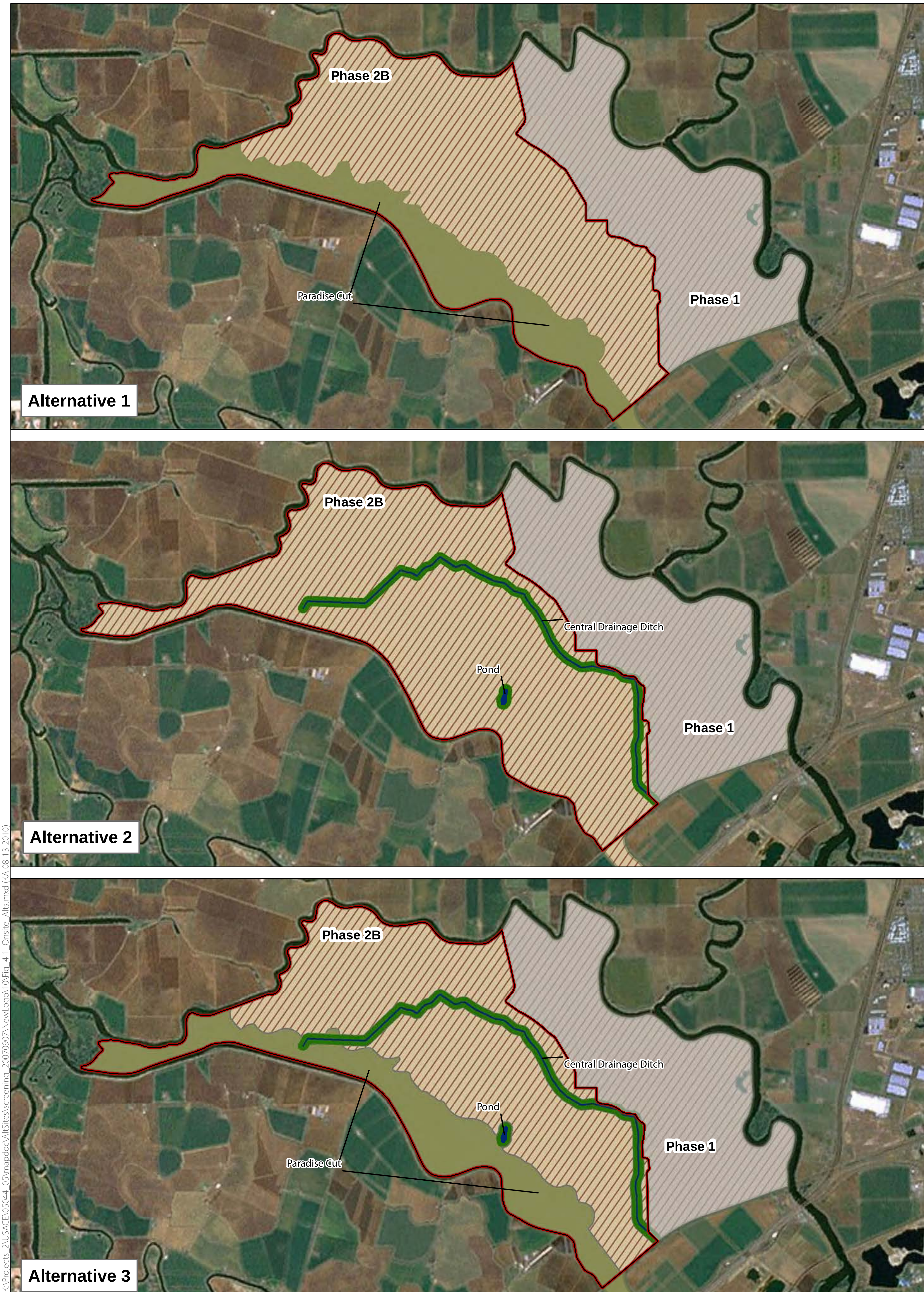
Outcomes—Onsite Alternatives

Screening identified six potentially viable approaches to reduce or avoid adverse environmental effects associated with River Islands Phase 2B as proposed. All of these approaches focus on modifications to project design (community layout). They include:

- eliminating the Lathrop Landing Back Bay, or constructing it as an internal feature with no connection to jurisdictional waters;
- reducing the number of boat docks in jurisdictional waters, or eliminating external boat docks altogether;
- modifying the flood protection approach to rely more heavily on internal levees, avoiding the need to alter Paradise Cut and existing federal project levees; and
- modifying the community layout to avoid encroaching on jurisdictional waters internal to Stewart Tract (the existing pond and agricultural ditch).
- no action, eliminating PCIP improvements (e.g., setback levees, lowered bench, high-ground refugia) and construction of an internal levee system;

The last three (modified flood protection, protection of inland waters, and elimination of PCIP improvements) offer the greatest potential to avoid aquatic resources impacts, with little additional (or stand-alone) benefit offered by the others. Accordingly, the following onsite alternatives will be carried forward for EIS analysis.

- Alternative 1—Phase 2B with Modified Flood Protection.
- Alternative 2—Phase 2B with Protection of Inland Waters.
- Alternative 3—Phase 2B with Modified Flood Protection and Protection of Inland Waters.
- No Action Alternative.



Phase 2B Limit
Phase 1 Limit
Available Development Footprint
Pond and Central Drainage Ditch*

Proposed Alternatives

No Modification to Paradise Cut, with Expanded Setback Levees
Protection of Central Drainage Ditch and Pond - 200 foot Buffer

August 2010

Figure 4-1
Onsite Alternatives 1, 2, 3

0 0.25 0.5 0.75 1
Miles

ICF CONSULTING

*The approximated width of the Central Drainage Ditch is 40 feet.

N

Sources: Phase 1 and 2 boundaries, EDAW (2004)
Drainage ditch and pond, River Islands at Lathrop (2006)
Aerial, ESRI I3 Imagery Prime World (2008)

Chapter 5

Alternatives for EIS Analysis

No practicable alternate sites were identified, and no offsite alternatives involving construction of a project similar to proposed Phase 2B at an alternate location will be carried forward for EIS analysis.

The following onsite alternatives will be carried forward for EIS analysis.

- Alternative 1—Phase 2B with Modified Flood Protection.
- Alternative 2—Phase 2B with Protection of Inland Waters.
- Alternative 3—Phase 2B with Modified Flood Protection and Protection of Inland Waters.
- No Action Alternative.

The No Action Alternative will be analyzed in the EIS, consistent with discussion in the memorandum "Federal Action and No Action Conditions—CWA Section 404 Permitting for Proposed River Islands at Lathrop Development," dated September 15, 2006. Under the No Action Alternative, federal permits per Section 404 of the Clean Water Act and 33 USC Section 408 would not be issued, and a modified version of River Islands Phase 2B would be implemented with no PCIP improvements and construction of a new interior levee system. River Islands Phases 1 and 2A are already under construction. Their completion is assumed to be reasonably foreseeable, and therefore, will be analyzed as part of the No Action Alternative condition and included in EIS discussion of cumulative effects.

Chapter 6
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Appendix D – MBK Draft Hydraulic Analysis
for River Islands at Lathrop

River Islands at Lathrop
Hydraulic Impact Analysis

Prepared for

River Islands at Lathrop

Prepared by

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May 13, 2010

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1. Introduction

The proposed River Islands at Lathrop ("River Islands") Project is located within the City of Lathrop in San Joaquin County, CA. River Islands is a 5,000 acre mixed-use master planned community located on Stewart Tract, a high ground island (the interior of the island is above sea level) located in the Secondary Zone of the San Joaquin/Sacramento Delta. Stewart Tract is adjacent to the Paradise Cut Flood Bypass ("Paradise Cut") which was designed to divert flood waters away from urban areas along the San Joaquin River to the San Francisco Bay. Paradise Cut is part of the 1955 Federal Project Levee System. The flow split between the San Joaquin River and the Paradise Cut is not functioning as envisioned by the original design by the United States Army Corps of Engineers (USACE). The current condition sends more water down the San Joaquin River to the urban areas than the original design intent. This appears to be a result of the constructed project not functioning as designed rather than poor maintenance practices.

The proposed project would enlarge and improve portions of Paradise Cut by setting back the right bank levee and excavating a portion of the floodway just downstream of the Paradise Weir. These features would improve the hydraulic efficiency of the Paradise Cut, allowing additional flood flows through the channel, which will help to restore the original design flow split.

River Islands is divided into two phases. Phase 1 includes approximately 40% of the development area and is not subject to any additional Federal actions. Infrastructure for Phase 1 is currently under construction. Phase 2 requires a Section 404 permit for the fill of wetlands and waters of the United States, Section 10 Rivers & Harbors Act approvals (e.g. bridges), and authorization under 33 U.S.C. 408 for the approval of alterations to the Federal Project Levees.

The USACE is currently preparing an Environmental Impact Statement (EIS) for River Islands that will include a hydraulic impact analysis associated with the proposed project. This analysis will include both a traditional deterministic analysis as well as a Risk Analysis as required by the USACE to support the Section 408 Summary Report. The "Ground Rules" for the Risk Analysis are included as Appendix A.

2. Hydraulic Simulation Model

A HEC-RAS computer simulation model of the lower San Joaquin River (LSJR Model) was used to perform hydraulic analyses. HEC-RAS is a computer program developed by the USACE Hydrologic Engineering Center that performs one-dimensional steady and unsteady hydraulic calculations for a full network of natural and constructed channels. Version 4.0 of HEC-RAS was used for this analysis. The LSJR Model was calibrated using the January 1997 flood event and the February 1998 high flow event. The development, calibration and verification of the model are described in detail in the MBK Engineers report "Lower San Joaquin River (LSJR) HEC-RAS Hydraulic Computer Simulation Model Development, Calibration and Verification", dated January 27, 2006 (MBK 2006a).

The LSJR Model study area includes the San Joaquin River from Vernalis to the Stockton Deep Water Channel, Old River from the San Joaquin River to the west end of Fabian Tract near

Clifton Court Forebay, Middle River from Old River to Highway 4, and the entirety of Paradise Cut, Salmon Slough and Grant Line Canal. A schematic of the LSJR Model river reaches is provided in Figure 1.

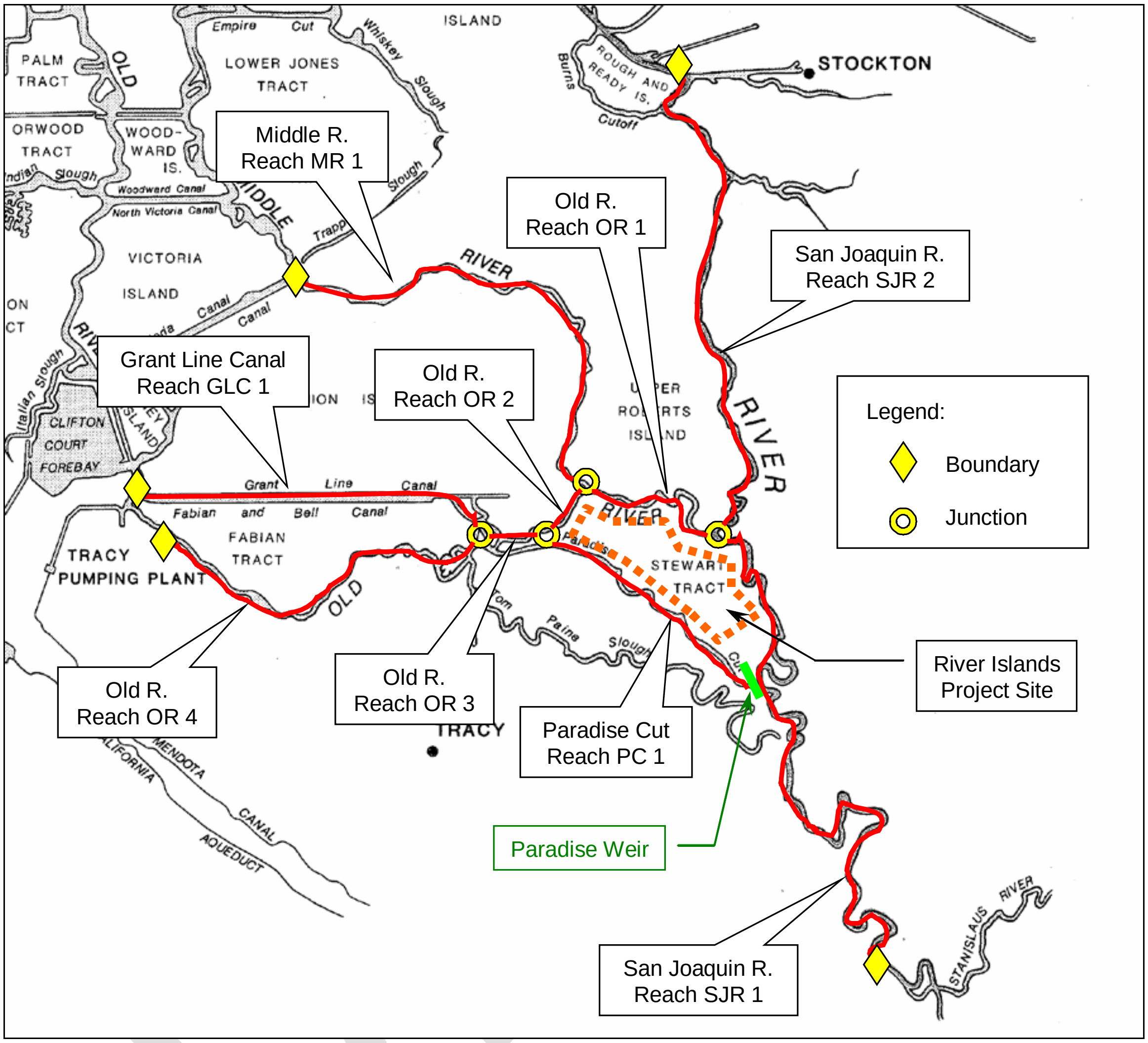


Figure 1. Lower San Joaquin River HEC-RAS Model River Reach Schematic

3. Hydrology

The hydrologic data used for the analysis consists of flow data at the upstream model boundary and stage data at the downstream boundaries. The upstream boundary flow data used for this analysis was extracted from hydraulic simulations of the San Joaquin River and tributaries performed by USACE as part of the Sacramento and San Joaquin River Basin Comprehensive Study (Comp Study) (USACE 2002). The Comp Study hydraulic analysis included simulations of a number of storm centerings that were designed to stress the flood control system at specific locations. The River Islands hydraulic analysis used flow data from the Comp Study simulation of the San Joaquin River Mainstem at Latitude of Vernalis storm centering

The San Joaquin River Comp Study hydrologic data set contains flow data for the following flood frequencies: 10-year (10%), 25-year (4%), 50-year (2%), 100-year (1%), 200-year (0.5%) and 500-year (0.2%).

Simulation results for the 50-year, 100-year, 200-year and 500-year flood events are presented in this report.

4. Study Scenarios

The analysis was performed for three scenarios:

1) Existing Condition ("Existing"): This scenario includes currently existing levee alignments and channel geometry for Stewart Tract and the surrounding area, as shown in Figure 2. Approximately 25% of the development area is already protected by levees recently accredited by FEMA and are considered part of the Existing Condition.
2) No Action Alternative ("No Action"): This scenario evaluates hydraulic impacts for flood protection which could be built without triggering a Federal action. This scenario consists of a FEMA accredited interior levee that does not come in contact with Federal Project levee or any waters of the U.S., as shown in Figure 3.
3) Proposed Project Improvements ("With Project"): This scenario includes the improvements for River Islands as described in "Lower San Joaquin River HEC-RAS Model, Modeling of River Islands at Lathrop Post-Project Conditions" dated May 10, 2006 (MBK 2006b), with the following changes. The proposed "back-bays" on Old River, designated as OR1 through OR7 in MBK 2006b, are no longer part of the "With Project" condition. An overflow weir with a length of 1,500 feet and crest elevation of 25.0 feet (NGVD29) has been added to the cross levee to reduce impacts to peak water surface elevations in Paradise Cut. The "With Project" alternative is shown in Figure 4.

For the hydraulic analysis, all three scenarios assumed that all of the San Joaquin River Flood Control Project (SJRFCP) levees are in compliance with minimum design freeboard requirements. That is, if existing top of levee elevation data indicated that a levee is freeboard deficient relative to the SJRFCP design flood plane (1955 Profile), the hydraulic model was modified to increase the top of levee to meet the minimum authorized height.

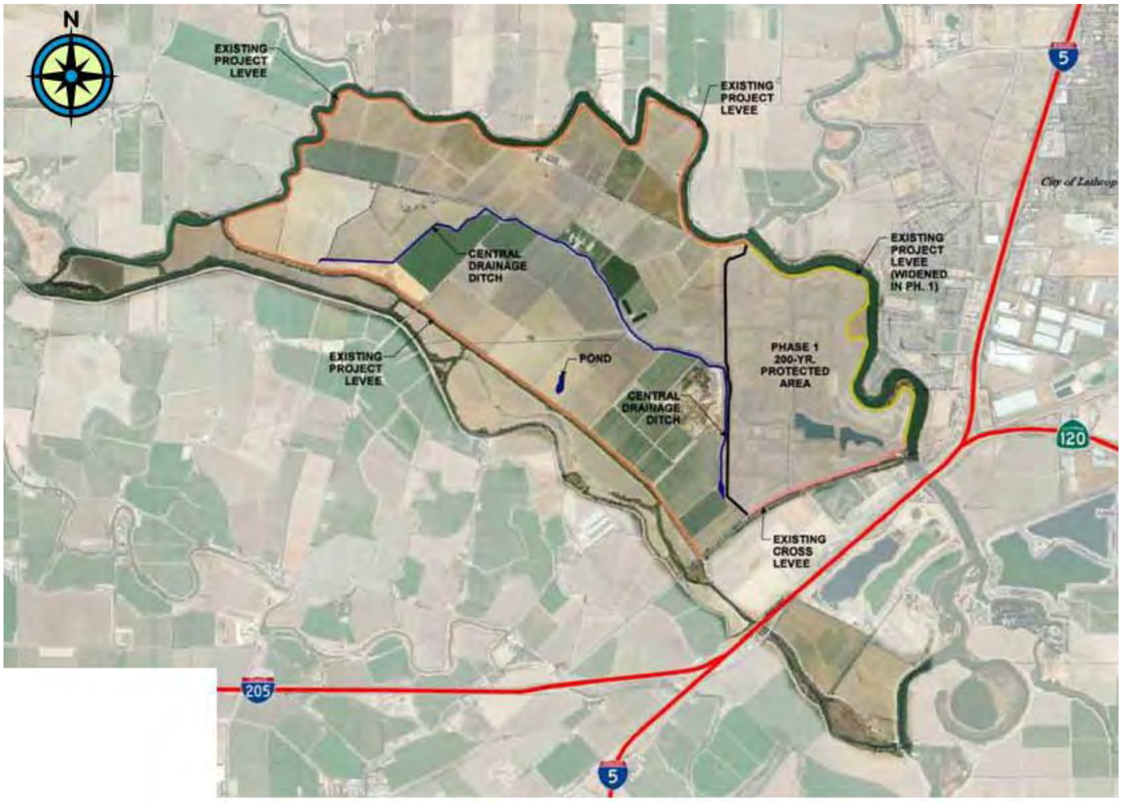


Figure 2. Existing Scenario

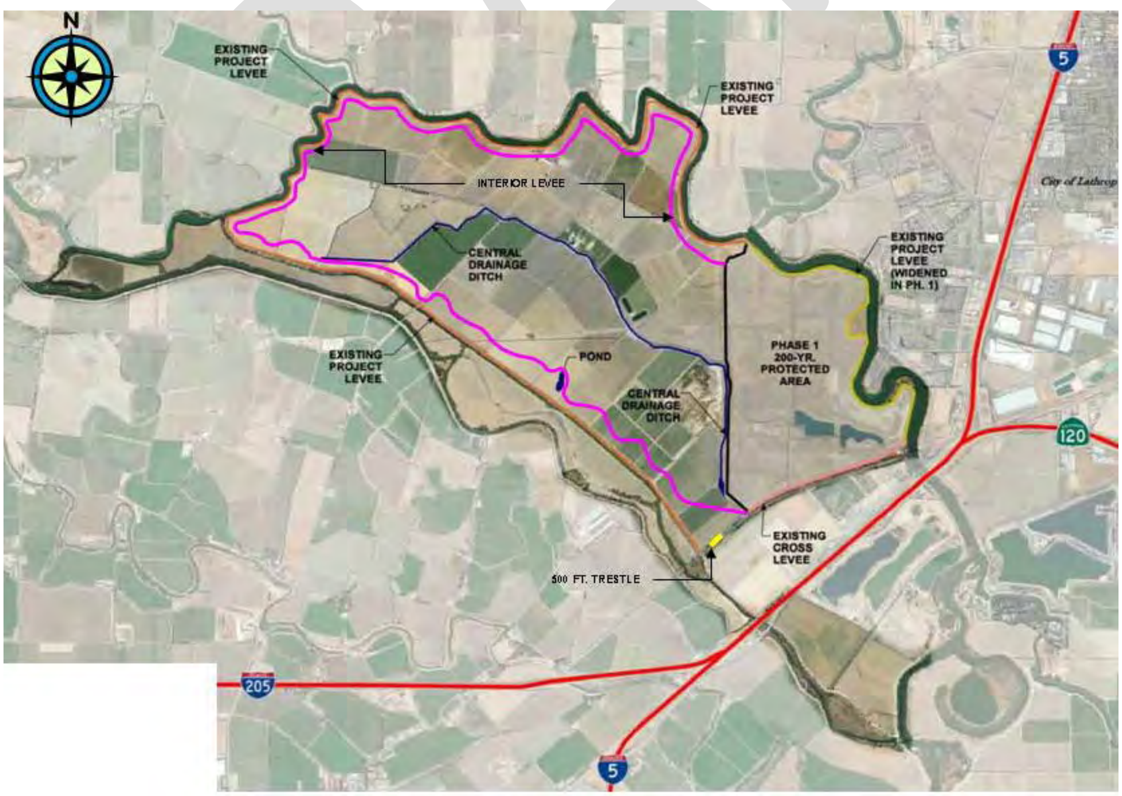


Figure 3. No Action Scenario

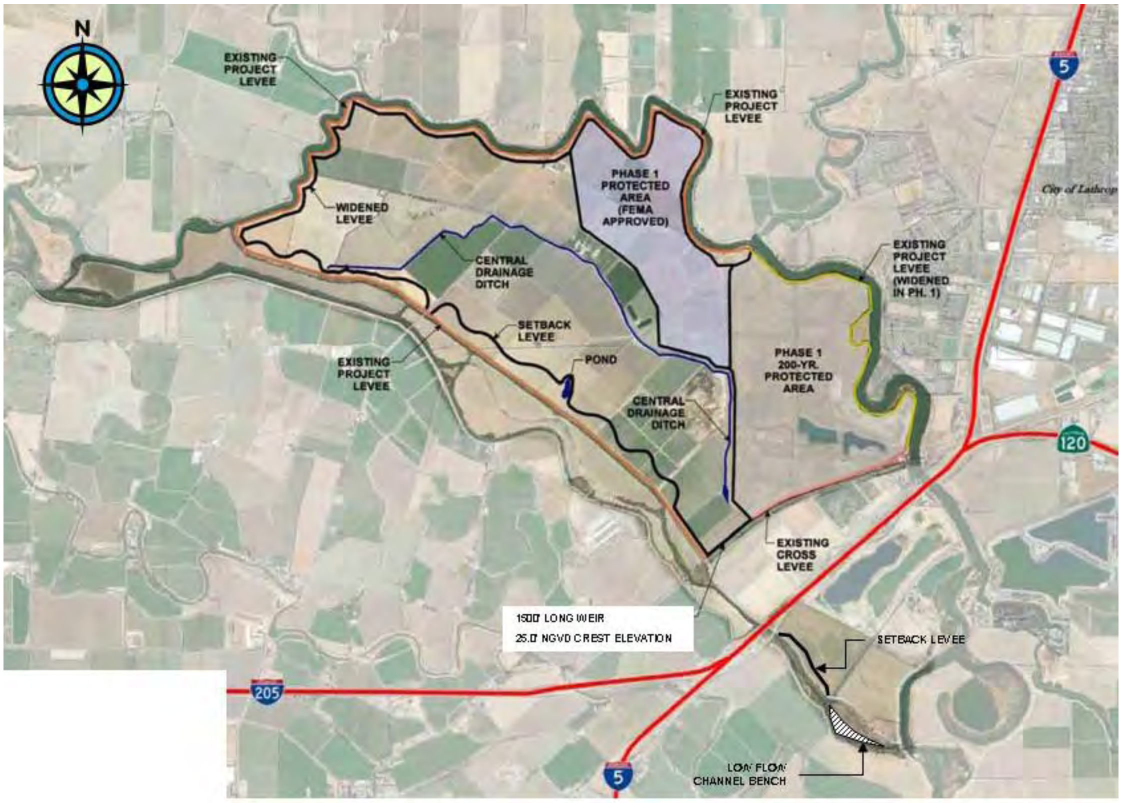


Figure 4. With Project Scenario

5. Analysis

All of the reaches in the Lower San Joaquin River HEC-RAS model have levees on both sides of the river. The levees on the San Joaquin River, Paradise Cut and Old River above Sugar Cut are Federal Project levees and have a design elevation that is based on a flood event with an estimated recurrence interval of approximately 50 years (1955 Profile) or a 1 in 50 Annual Exceedence Probability (AEP). In the hydraulic analysis an assumption must be made with regards to how levees will perform when subjected to flood events greater than the system design, which in this analysis are the 100-year, 200-year and 500-year flood events. The USACE has specified that risk based hydraulic impact analysis will assume that levees overtop without failing. For the lower San Joaquin River a significant portion of the levee system overtops in the 200-year and 500-year flood events as summarized in Table 1. There are approximately 52 miles of levee on the San Joaquin River, Old River and Paradise Cut at and upstream of Stewart Tract. As shown in Table 1, almost 20 out of the 52 miles of levee are overtopped in the 200-year flood event and 29 miles of levee are overtopped in the 500-year flood event. Given these conditions, increases in the water surface elevations in the river channels for the 200-year and 500-year flood events are not the primary indicator of the change in flood risk, especially if the floodplain adjacent to the levees is already inundated from upstream levee overtopping.

The deterministic hydraulic analysis presented herein was performed with the assumption that levees will overtop without failing. Also presented to demonstrate the sensitivity of the levee failure assumption, are the results of the deterministic hydraulic impact analysis performed with the assumption that levees fail when water reaches the top of the levee.

Table 1. Length and Depth of Levee Overtopping Under Existing Conditions						
			Levee Overtopping			
			Left Side [1]		Right Side [1]	
Reach	Total Reach Length	Flood Event	Length (miles)	Maximum Depth (ft.)	Length (miles)	Maximum Depth (ft.)
San Joaquin River						
Vernalis to Paradise Cut	11.4 mi.	50-yr	0	0	0	0
		100-yr	0	0	0.5	0.3
		200-yr	4.4	1.0	9.5	2.8
		500-yr	6.8	1.5	10.6	4.6
Paradise Cut to Old River	5.0 mi.	50-yr	0	0	0	0
		100-yr	0	0	0.8	1.4
		200-yr	1.5	3.0	1.0	4.4
		500-yr	1.6	4.8	1.2	6.2
Paradise Cut						
Paradise Weir to I-5	1.2 mi.	50-yr	0	0	0	0
		100-yr	0	0	0	0
		200-yr	0.6	2.1	0.9	1.4
		500-yr	1.1	4.0	1.2	3.2
I-5 to UPRR	0.6 mi.	50-yr	0	0	0	0
		100-yr	0	0	0	0
		200-yr	<0.1	0.3	0	0
		500-yr	0.6	2.4	0.2	0.6
UPRR to Old River	4.0 mi.	50-yr	0	0	0	0
		100-yr	0	0	0	0
		200-yr	0	0	1.3	1.6
		500-yr	0	0	3.8	4.2
Old River						
San Joaquin R. to Middle R.	4.1 mi.	50-yr	0	0	0	0
		100-yr	0	0	0	0
		200-yr	0	0	0.6	1.4
		500-yr	0.5	2.0	1.6	2.4
[1] Referenced to looking downstream.						

6. Results

Hydraulic impacts to peak water surface elevations in the river channels were determined at the Index Points shown in Figure 5. As previously discussed, significant levee overtopping occurs in the 200-year and 500-year flood simulations for the adjacent agricultural areas. To determine if impacts to these areas are significant, changes to peak water surface elevations in the floodplains are presented for the locations noted in Figure 6. The computed peak water surface elevations and impacts for the three simulated scenarios under the assumption that levees overtop without failing are summarized in Table 2 and peak water surface profile plots are provided in Appendix B. The same information from simulations assuming levees fail when the water reaches the top of levee is provided in Table 3 and in Appendix C.

In the 50-year flood event, which represents the system design flood event, there is no difference in maximum water surface elevations (WSE) between the Existing and No Action scenarios. The "With Project" scenario shows a small reduction in the maximum WSE in the San Joaquin River on the order of 0.2 ft. and a larger reduction of up to 1.1 ft. on Paradise Cut. In Old River and Grant Line Canal to the west of Stewart Tract the "With Project" scenario shows a negligible WSE increase of up to 0.02 ft.

In the 100-year flood event there is no difference in maximum water surface elevations (WSE) between the Existing and No Action scenarios. The "With Project" scenario shows a small reduction in the maximum WSE in the San Joaquin River on the order of 0.1 ft. and a larger reduction of up to 0.7 ft. on Paradise Cut. In Old River and Grant Line Canal to the west of Stewart Tract the "With Project" scenario shows a small WSE increase of up to 0.07 ft.

In the 200-year and 500-year flood events there were negligible impacts on the San Joaquin River maximum WSE ranging from -0.02 ft. to +0.07 ft. In the 200-year flood event the maximum increase in stage on the Paradise Cut is 1.9 ft. for the "No Action" scenario and 1.5 ft. for the "With Project" scenario. In the 500-year flood event the maximum increase in stage on the Paradise Cut is 1.4 ft. for the "No Action" scenario and 0.8 ft. for the "With Project" scenario. However, it should be noted that the floodplains adjacent to these Paradise Cut impact locations are flooded in the 200-year and 500-year floods as a result of upstream levee overtopping. The 200-year and 500-year peak flood stages in these adjacent floodplains are shown in Figure 7.

Since it is highly unlikely levees will overtop without failure it is arguably more appropriate to use a hydraulic analysis in which levees are assumed to fail when evaluating the impacts to the floodplains. For this reason Figure 7 also shows the peak flood stages for the analysis in which levees were assumed to fail when water reached the top of levee. Under this condition the impact of the Project to the floodplain peak flood stage is small relative the overall depth of flooding.

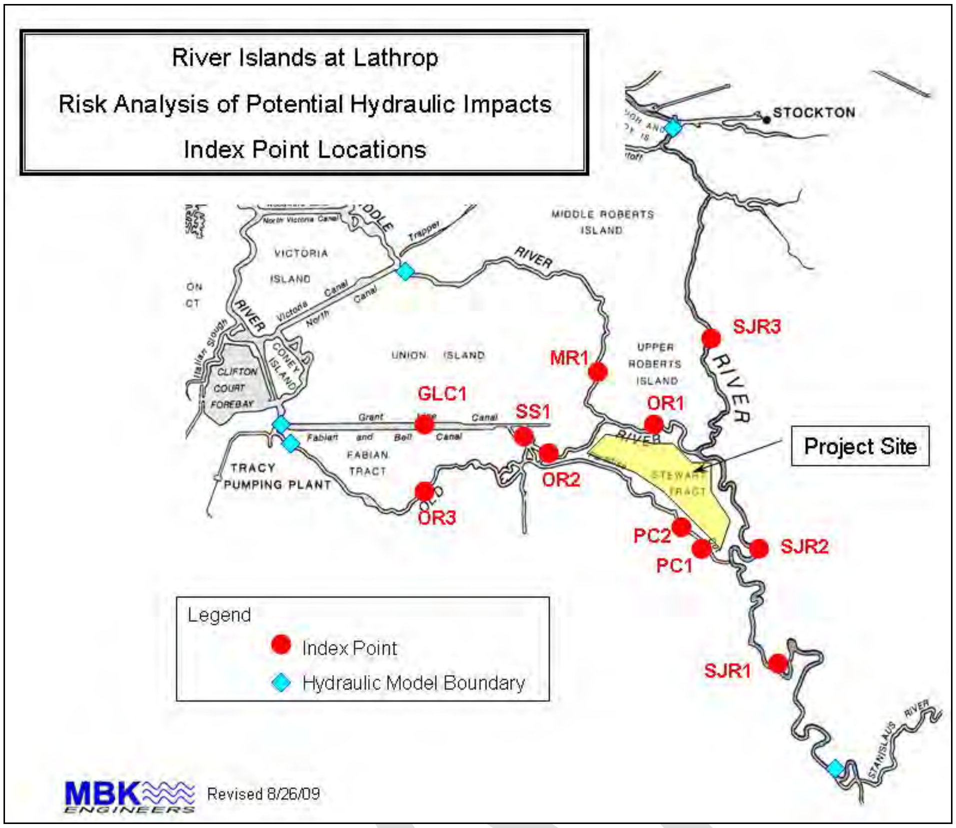


Figure 5. Index Point Locations

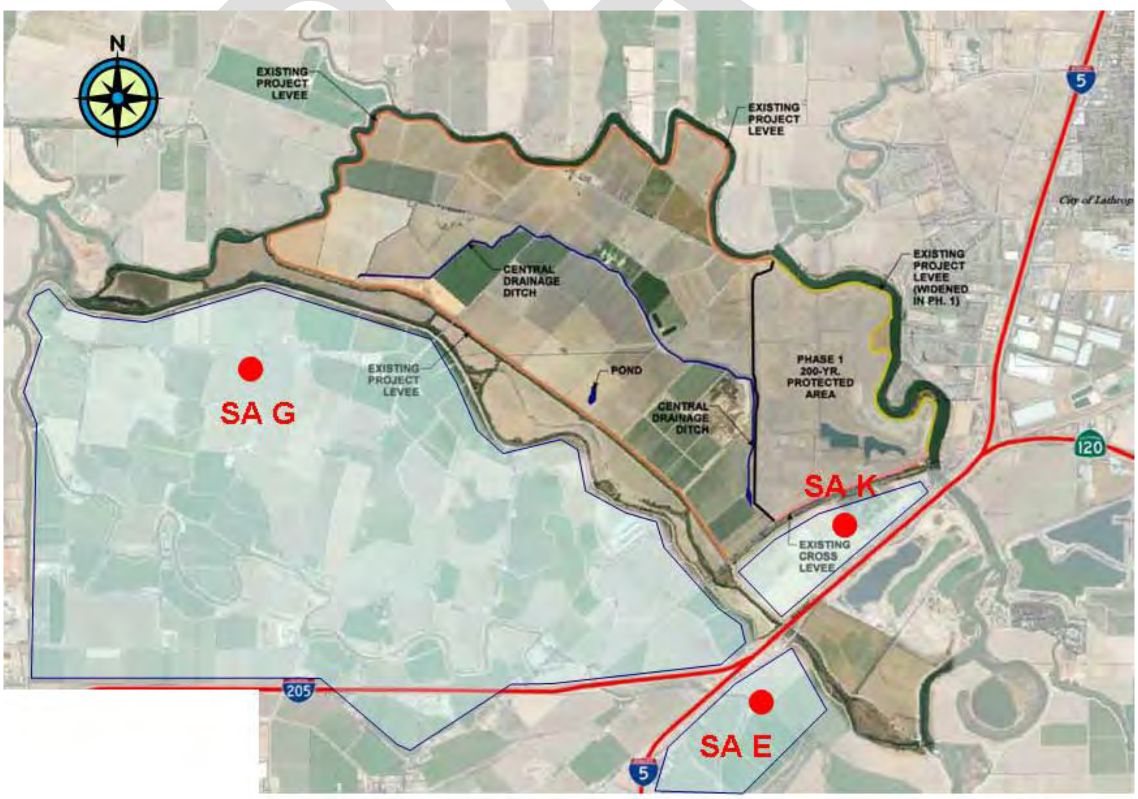
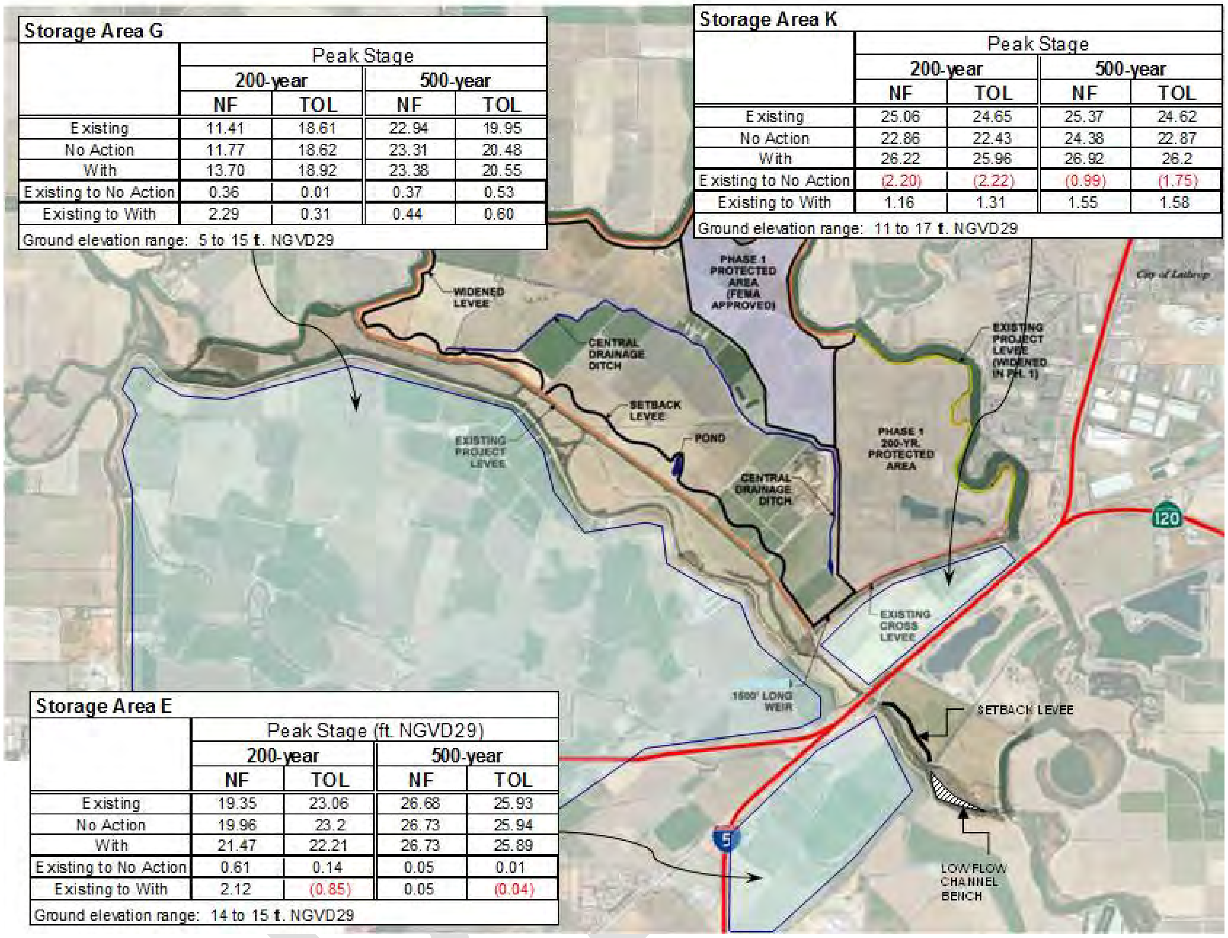


Figure 6. Floodplain Impact Locations



Storage Area G

	Peak Stage			
	200-year		500-year	
	NF	TOL	NF	TOL
Existing	11.41	18.61	22.94	19.95
No Action	11.77	18.62	23.31	20.48
With	13.70	18.92	23.38	20.55
Existing to No Action	0.36	0.01	0.37	0.53
Existing to With	2.29	0.31	0.44	0.60

Ground elevation range: 5 to 15 ft. NGVD29

Storage Area K

	Peak Stage			
	200-year		500-year	
	NF	TOL	NF	TOL
Existing	25.06	24.65	25.37	24.62
No Action	22.86	22.43	24.38	22.87
With	26.22	25.96	26.92	26.2
Existing to No Action	(2.20)	(2.22)	(0.99)	(1.75)
Existing to With	1.16	1.31	1.55	1.58

Ground elevation range: 11 to 17 ft. NGVD29

Storage Area E

	Peak Stage (ft. NGVD29)			
	200-year		500-year	
	NF	TOL	NF	TOL
Existing	19.35	23.06	26.68	25.93
No Action	19.96	23.2	26.73	25.94
With	21.47	22.21	26.73	25.89
Existing to No Action	0.61	0.14	0.05	0.01
Existing to With	2.12	(0.85)	0.05	(0.04)

Ground elevation range: 14 to 15 ft. NGVD29

Figure 7. Peak Stage Impacts in Floodplains

Table 2. Maximum Water Surface Elevation Impacts, Levees Overtop Without Failing

Index Point	Flood Event	Maximum Water Surface Elev. (ft. NGVD29)			Change (ft.)		
		Existing	No Action	With	Existing to No Action	Existing to With	No Action to With
SJR1	50-yr	26.58	26.58	26.51	0	-0.07	-0.07
	100-yr	32.10	32.10	32.06	0	-0.04	-0.04
	200-yr	32.98	32.98	32.98	0	0	0
	500-yr	33.43	33.43	33.43	0	0	0
SJR2	50-yr	21.95	21.95	21.81	0	-0.14	-0.14
	100-yr	27.09	27.09	27.03	0	-0.06	-0.06
	200-yr	30.17	30.18	30.16	+0.01	-0.01	-0.02
	500-yr	31.95	31.95	31.95	0	0	0
SJR3	50-yr	13.49	13.49	13.43	0	-0.06	-0.06
	100-yr	16.59	16.59	16.57	0	-0.02	-0.02
	200-yr	18.57	18.64	18.63	+0.07	+0.06	-0.01
	500-yr	19.17	19.19	19.18	+0.02	+0.01	-0.01
PC1	50-yr	19.13	19.13	19.11	0	-0.02	-0.02
	100-yr	23.23	23.23	23.18	0	-0.05	-0.05

Table 2. Maximum Water Surface Elevation Impacts, Levees Overtop Without Failing							
Index Point	Flood Event	Maximum Water Surface Elev. (ft. NGVD29)			Change (ft.)		
		Existing	No Action	With	Existing to No Action	Existing to With	No Action to With
	200-yr	26.04	26.09	26.30	+0.05	+0.26	+0.21
	500-yr	28.32	28.33	28.23	+0.01	-0.09	-0.10
PC2	50-yr	16.07	16.07	15.77	0	-0.30	-0.30
	100-yr	18.96	18.96	18.68	0	-0.28	-0.28
	200-yr	21.91	22.93	23.37	+1.02	+1.46	+0.44
	500-yr	23.80	24.24	24.63	+0.44	+0.83	+0.39
PC3	50-yr	13.40	13.40	13.08	0	-0.32	-0.32
	100-yr	16.60	16.60	16.41	0	-0.19	-0.19
	200-yr	19.83	21.71	20.48	+1.88	+0.65	-1.23
	500-yr	22.37	23.48	22.53	+1.11	+0.16	-0.95
OR1	50-yr	14.75	14.75	14.69	0	-0.06	-0.06
	100-yr	18.91	18.91	18.92	0	+0.01	+0.01
	200-yr	21.03	21.45	21.27	+0.42	+0.24	-0.18
	500-yr	22.20	22.17	22.12	-0.03	-0.08	-0.05
OR2	50-yr	10.73	10.73	10.75	0	+0.02	+0.02
	100-yr	13.96	13.96	14.03	0	+0.07	+0.07
	200-yr	17.06	18.10	17.38	+1.04	+0.32	-0.72
	500-yr	20.20	20.22	20.16	+0.02	-0.04	-0.06
OR3	50-yr	8.77	8.77	8.78	0	+0.01	+0.01
	100-yr	11.41	11.41	11.46	0	+0.05	+0.05
	200-yr	14.05	14.93	14.33	+0.88	+0.28	-0.60
	500-yr	16.13	16.14	16.11	+0.01	-0.02	-0.03
MR1	50-yr	11.85	11.85	11.82	0	-0.03	-0.03
	100-yr	15.13	15.13	15.14	0	+0.01	+0.01
	200-yr	16.62	16.84	16.71	+0.22	+0.09	-0.13
	500-yr	17.27	17.26	17.24	-0.01	-0.03	-0.02
SS1	50-yr	10.51	10.51	10.53	0	+0.02	+0.02
	100-yr	13.71	13.71	13.77	0	+0.06	+0.06
	200-yr	16.78	17.81	17.10	+1.03	+0.32	-0.71
	500-yr	19.90	19.92	19.86	+0.02	-0.04	-0.06
GLC1	50-yr	9.20	9.20	9.22	0	+0.02	+0.02
	100-yr	11.69	11.69	11.74	0	+0.05	+0.05
	200-yr	14.17	15.02	14.44	+0.85	+0.27	-0.58
	500-yr	16.78	16.80	16.75	+0.02	-0.03	-0.05
SA E	50-yr	na	na	na	na	na	na
	100-yr	na	na	na	na	na	na
	200-yr	19.35	19.96	21.47	+0.61	+2.12	+1.51
	500-yr	26.68	26.73	26.73	+0.05	+0.05	0
SA G	50-yr	na	na	na	na	na	na
	100-yr	na	na	na	na	na	na
	200-yr	11.41	11.77	13.70	+0.36	+2.29	+1.93
	500-yr	22.94	23.31	23.38	+0.37	+0.44	+0.07
SA K	50-yr	na	na	na	na	na	na

Table 2. Maximum Water Surface Elevation Impacts, Levees Overtop Without Failing

Index Point	Flood Event	Maximum Water Surface Elev. (ft. NGVD29)			Change (ft.)		
		Existing	No Action	With	Existing to No Action	Existing to With	No Action to With
	100-yr	na	na	na	na	na	na
	200-yr	25.06	22.86	26.22	-2.20	+1.16	+3.36
	500-yr	25.37	24.38	26.92	-0.99	+1.55	+2.54

Table 3. Maximum Water Surface Elevation Impacts, Levees Fail When Water Reaches Top of Levee

Index Point	Flood Event	Maximum Water Surface Elev. (ft. NGVD29)			Change (ft.)		
		Existing	No Action	With	Existing to No Action	Existing to With	No Action to With
SJR1	50-yr	25.66	25.66	25.59	0	-0.07	-0.07
	100-yr	30.72	30.72	30.71	0	-0.01	-0.01
	200-yr	32.02	32.02	31.99	0	-0.03	-0.03
	500-yr	32.20	32.20	32.18	0	-0.02	-0.02
SJR2	50-yr	21.09	21.09	20.95	0	-0.14	-0.14
	100-yr	25.65	25.64	25.62	-0.01	-0.03	-0.02
	200-yr	27.85	27.85	27.83	0	-0.02	-0.02
	500-yr	28.66	28.67	29.05	+0.01	+0.39	+0.38
SJR3	50-yr	12.99	12.99	12.93	0	-0.06	-0.06
	100-yr	15.58	15.57	15.58	-0.01	0	+0.01
	200-yr	16.99	16.98	16.99	-0.01	0	+0.01
	500-yr	17.29	17.28	17.63	-0.01	+0.34	+0.35
PC1	50-yr	18.41	18.41	18.41	0	0	0
	100-yr	22.09	22.08	22.09	-0.01	0	+0.01
	200-yr	25.33	25.30	25.45	-0.03	+0.12	+0.15
	500-yr	26.35	26.36	26.26	+0.01	-0.09	-0.10
PC2	50-yr	15.60	15.60	15.25	0	-0.35	-0.35
	100-yr	18.09	18.08	17.82	-0.01	-0.27	-0.26
	200-yr	21.52	21.83	23.08	+0.31	+1.56	+1.25
	500-yr	22.54	22.66	23.46	+0.12	+0.92	+0.80
PC3	50-yr	12.90	12.90	12.55	0	-0.35	-0.35
	100-yr	15.58	15.57	15.38	-0.01	-0.20	-0.19
	200-yr	18.55	20.40	19.83	+1.85	+1.28	-0.57
	500-yr	21.02	21.73	21.25	+0.71	+0.23	-0.48
OR1	50-yr	14.09	14.09	14.03	0	-0.06	-0.06
	100-yr	17.64	17.64	17.66	0	+0.02	+0.02
	200-yr	19.23	19.22	19.24	-0.01	+0.01	+0.02
	500-yr	20.43	20.37	20.45	-0.06	+0.02	+0.08
OR2	50-yr	10.25	10.25	10.27	0	+0.02	+0.02
	100-yr	12.91	12.91	12.99	0	+0.08	+0.08
	200-yr	16.44	16.67	16.87	+0.23	+0.43	+0.20
	500-yr	18.64	18.69	18.74	+0.05	+0.10	+0.05

Table 3. Maximum Water Surface Elevation Impacts, Levees Fail When Water Reaches Top of Levee

Index Point	Flood Event	Maximum Water Surface Elev. (ft. NGVD29)			Change (ft.)		
		Existing	No Action	With	Existing to No Action	Existing to With	No Action to With
OR3	50-yr	8.44	8.44	8.45	0	+0.01	+0.01
	100-yr	10.55	10.55	10.61	0	+0.06	+0.06
	200-yr	13.52	13.72	13.88	+0.20	+0.36	+0.16
	500-yr	14.99	15.06	15.24	+0.07	+0.25	+0.18
MR1	50-yr	11.34	11.34	11.31	0	-0.03	-0.03
	100-yr	13.55	13.55	13.59	0	+0.04	+0.04
	200-yr	14.81	14.98	14.98	+0.17	+0.17	0
	500-yr	15.74	15.80	15.85	+0.06	+0.11	+0.05
SS1	50-yr	10.04	10.04	10.07	0	+0.03	+0.03
	100-yr	12.66	12.66	12.74	0	+0.08	+0.08
	200-yr	16.17	16.40	16.59	+0.23	+0.42	+0.19
	500-yr	18.35	18.40	18.45	+0.05	+0.10	+0.05
GLC1	50-yr	8.87	8.87	8.89	0	+0.02	+0.02
	100-yr	10.89	10.88	10.95	-0.01	+0.06	+0.07
	200-yr	13.68	13.87	14.02	+0.19	+0.34	+0.15
	500-yr	15.48	15.53	15.56	+0.05	+0.08	+0.03
SA E	50-yr	na	na	na	na	na	na
	100-yr	na	na	na	na	na	na
	200-yr	23.06	23.20	22.21	+0.14	-0.85	-0.99
	500-yr	25.93	25.94	25.89	+0.01	-0.04	-0.05
SA G	50-yr	na	na	na	na	na	na
	100-yr	na	na	na	na	na	na
	200-yr	18.61	18.62	18.92	+0.01	+0.31	+0.30
	500-yr	19.95	20.48	20.55	+0.53	+0.60	+0.07
SA K	50-yr	na	na	na	na	na	na
	100-yr	na	na	na	na	na	na
	200-yr	24.65	22.43	25.96	-2.22	+1.31	+3.53
	500-yr	24.62	22.87	26.20	-1.75	+1.58	+3.33

7. Determination of Significance of Impacts

To determine whether an increase in stage is significant, the following factors have been taken into consideration:

- How much of the change in stage is associated with restoring the design flow split and does the modification result in a flow split that exceeds the 1955 design?
- What is the change in stage for the design flood event (50-year for this system)?
- What are the changes in stage for events that exceed the design event?
- Are adjacent areas urban or non-urban?
- Are the adjacent agricultural areas that experience increases in stage in the river channel already flooded due to upstream levees overtopping? If the adjacent agricultural areas are

flooded due to upstream levee overtopping, what is the change in floodplain depth with the proposed project?
- Does the duration of flooding change as a result of the proposed project?

The following is an analysis of the impacts of the proposed project based on an evaluation of the factors cited above.

How much of the change in stage is associated with restoring the design flow split and does the modification result in a flow split that exceeds the 1955 design? The design flow in the Paradise Cut is 15,000 cfs, 28.8% of the design flow of 52,000 cfs in the San Joaquin River. Under existing conditions, the computed peak flow for the 50-year event is 11,650 cfs, 24.6% of the computed peak flow of 47,400 cfs in the San Joaquin River. The computed 50-year peak flow in the Paradise Cut with the proposed project is 12,160 cfs, 25.7% of the computed peak flow of 47,400 cfs in the San Joaquin River.

What is the change in stage for the design flood event (50-year for this system)? The proposed project generally results in a decrease in flood stages for the design event for the surrounding river system. There are negligible increases downstream of the Paradise Cut on Old River and Grant Line Canal (0.02 ft).

What are the changes in stage for events that exceed the design event? Table 2 summarizes the change in flood stage for the flood control system.

Are adjacent areas urban or non-urban? The nearby urban areas are downstream along the San Joaquin River. The proposed project has negligible effects on the urban areas (maximum water surface elevation increase of 0.07 ft. in the 200-year flood event and 0.03 ft. in the 500-year flood event). The remaining adjacent and downstream areas are in agriculture.

Are the adjacent agricultural areas that experience increases in stage in the river channel already flooded due to upstream levees overtopping? If the adjacent agricultural areas are flooded due to upstream levee overtopping, what is the change in floodplain depth with the proposed project? Yes, the floodplains on both sides of the river adjacent to these impact locations are already flooded due to upstream levee overtopping. Table 6 includes index points for these floodplains (Storage Areas (SA) E, G and K) and shows how the depth in the adjacent floodplains changes with the proposed project. It may be more appropriate to use the simulations in which levees fail when overtopped when evaluating the impacts to the adjacent agricultural floodplains since this better represents the impact of the project on the adjacent landowners under the existing conditions. These results for these floodplains are shown in Table 7 (SA E, G and K).

Does the duration of flooding change as a result of the proposed project? The duration of flooding does not change as a result of the proposed project.

8. Summary/Conclusion

The proposed project will alter the flows in the surrounding levee system for the full range of flood events. These changes are generally beneficial for the frequent flood events (50 and 100 year), with increases in stage for the adjacent agricultural areas for the less frequent flood events (200 and 500 year). The adjacent and downstream urban areas are not impacted by the proposed project.

A significant portion of the change in flood stages can be attributed to improvements to the Paradise Cut that will allow the flow split to function as designed. The adjacent urban areas and not urban areas do not experience an increase in flood risk as a result of the proposed project as demonstrated in the Risk Analysis (Add report titles).

January 1997 is the storm of record for this region, with the estimated recurrence interval of 100-year for the 1-day duration flood volume (USACE 2002). Levee performance in the California Central Valley has generally been that levees fail before they overtop. During the January 1997 flood event, the largest event in recorded history on the San Joaquin River, 14 levee breaches occurred upstream of the Stewart Tract. So while the primary failure mechanism used in this analysis assumes the very worst case scenario of levees overtop without failing, in making a determination of significance of an impact, it is valuable to take into consideration the condition of levees failing when the water surface reaches the top of levee.

Taking into consideration the factors sighted in Section 7 of this memo, the hydraulic impacts of the proposed project are less than significant.

References

MBK Engineers, Lower San Joaquin River (LSJR) HEC-RAS Hydraulic Computer Simulation Model Development, Calibration and Verification, January 27, 2006 (MBK 2006a).

MBK Engineers, Lower San Joaquin River HEC-RAS Model, Modeling of River Islands at Lathrop Post-Project Conditions, May 10, 2006 (MBK 2006b).

U.S. Army Corps of Engineers, Sacramento and San Joaquin River Basins Comprehensive Study, Technical Studies Documentation, December 2002 (USACE 2002).

Appendix A

Proposed Ground Rules for Section 408 Risk Analysis of
Potential Hydraulic Impacts of River Islands at Lathrop Project

April 14, 2010

Proposed Ground Rules for Section 408 Risk Analysis of Potential Hydraulic Impacts of River Islands at Lathrop Project

1. Levee Performance

    a. Levees overtop without failing.

2. Evaluation Scenarios

    a. **Existing** - existing (Feb. 2010) levees and channel geometry (see Figure 1). In addition:

        i. If levees do not meet the minimum project standard they would be raised in the hydraulic model to meet the minimum authorized levee height (1955 Profile); and

        ii. Where existing top of levees heights exceed the authorized height, they are modeled as such.

    b. **No Action** - FEMA certifiable interior levee constructed for entire project site (see Figure 2). Interior levee does not come in contact with Federal Project levee or required levee easements. Represents River Islands Project that would be constructed absent federal permits.

    c. **With Project** - Existing scenario plus addition of proposed River Islands Project and Paradise Cut Improvement Project (see Figure 3).

3. Hydrology

    a. Sacramento and San Joaquin River Basins Comprehensive Study San Joaquin River mainstem at Vernalis storm centering.

4. Risk Analysis Procedures

    a. System input flow-frequency curves derived using the same procedures as in the HEC Section 408 risk analysis demonstration project (June 2009) will be used. These curves represent the summation of regulated flow hydrographs at hydraulic model boundary conditions upstream of a given Index Point.

b. Inflow-Outflow relationships derived using the same procedures as in the demonstration project will be used. These relationships will be used to account for system routing and loss of flow due to spills over levees. This relationship translates the system input flow to a regulated flow at each of the Index Points.

c. Flow-discharge Transform Functions at Index Points will be based on an infinite levee scenario (no spills). This is a maximum flow versus maximum stage relationship.

d. The inflow-outflow relationship should be based on sensitivity analysis of Manning's n-value roughness coefficients and levee overtopping weir flow coefficients. The Manning's n-value uncertainty range will be determined recognizing model calibration variability at the index points. The levee overtopping weir coefficient is not a calibrated parameter so its uncertainty range will be based on the typical coefficient range for broad crested weirs of 2.6 to 3.1 as defined in the HEC-RAS Hydraulic Reference Manual, CPD-69, March 2008 (Table 8-1).

5. Analysis of Conditional Annual Exceedance Probability

a. The procedures being utilized will not produce a level of protection evaluation for each index point in the system. This is because of the necessity to make simplifying assumptions concerning levee performance and hydrologic inputs. The assumption of no levee failures will result in AEP's that are conditioned on that assumption and will thereby overestimate the level of protection provided throughout the system. Therefore for this analysis a Conditional Annual Exceedance Probability (C-AEP) will be calculated for each index point. All of the factors governing the "Conditional" aspect of the AEP will be documented.

b. "Conditional" Conditional Non-Exceedance Probabilities (C-CNP) shall be reported, too.

c. The target levee elevations used to compute Without Project Condition C-AEP and C-CNP's shall be consistent with the levee elevations used to establish the Base Condition (see item 2.a).

d. For Index Points controlled by backwater such that stage-discharge relationships do not exist, the analysis will be based on stage-frequency and not flow-frequency methodology. In these same areas the C-AEP's and C-CNP's will be based on the authorized levee elevation as shown on the 1955 Design flood profiles.

6. Index Point Locations

a. A list of index points is provided in Table 1. A map showing the index point locations is shown in Figure 4.

Table 1. Index Points

Reach	Location [1]	Index Point ID	Channel Invert Elev. (ft. NGVD29)	Fed Project Design Top of Levee, 1955 Profile (ft. NGVD29)	Top of Levee Elevation (ft. NGVD29)	Top of Levee Elevation Source
San Joaquin River						
Vernalis to Paradise Cut	63.24	SJR1	-19	32.1	31.8	CA Levee Database [2]
Paradise Cut to Old River	57.81	SJR2	-14	26.8	25.8	CA Levee Database [2]
Old River to model boundary	47.80	SJR3	-15	18.1	18.4	CA Levee Database [2]
Paradise Cut						
San Joaquin R. to Old R.	267.9	PC1	7	23.8	23.9	CA Levee Database [2]
San Joaquin R. to Old R.	239.3	PC2	-1	22.9	21.6	CA Levee Database [2]
San Joaquin R. to Old R.	115.7	PC3	-5	19.8	22.2	CA Levee Database [2]
Old River						
San Joaquin R. to Middle R.	142.0	OR1	-8	19.6	19.6	CA Levee Database [2]
Middle R. to Paradise Cut	172.06	OR2	-20	14.8	17.5	CA Levee Database [2]
Paradise Cut to model boundary	-100.5	OR3	-8	na	15.6	DWR bathymetry survey, 1997
Middle River						
Old R. to model boundary	26.251	MR1	-4	na	15.6	Comprehensive Study topo
Salmon Slough						
All	146.81	SS1	-14	14.4	19.4	CA Levee Database [2]
Grant Line Canal						
All	23.6	GLC1	-13	na	18.1	DWR bathymetry survey, 1997

[1] Hydraulic model cross-section ID. San Joaquin River and Middle River are referenced to Comp Study River Mile. Paradise Cut, Old River and Grant Line Canal are based on individual reach stationing on 100 foot increments.

[2] Converted from vertical datum NAVD88 to NGVD29 based on relationship of 0 ft. NGVD29 = 2.4 ft. NAVD88 as per Carlson, Barbee, Gibson.

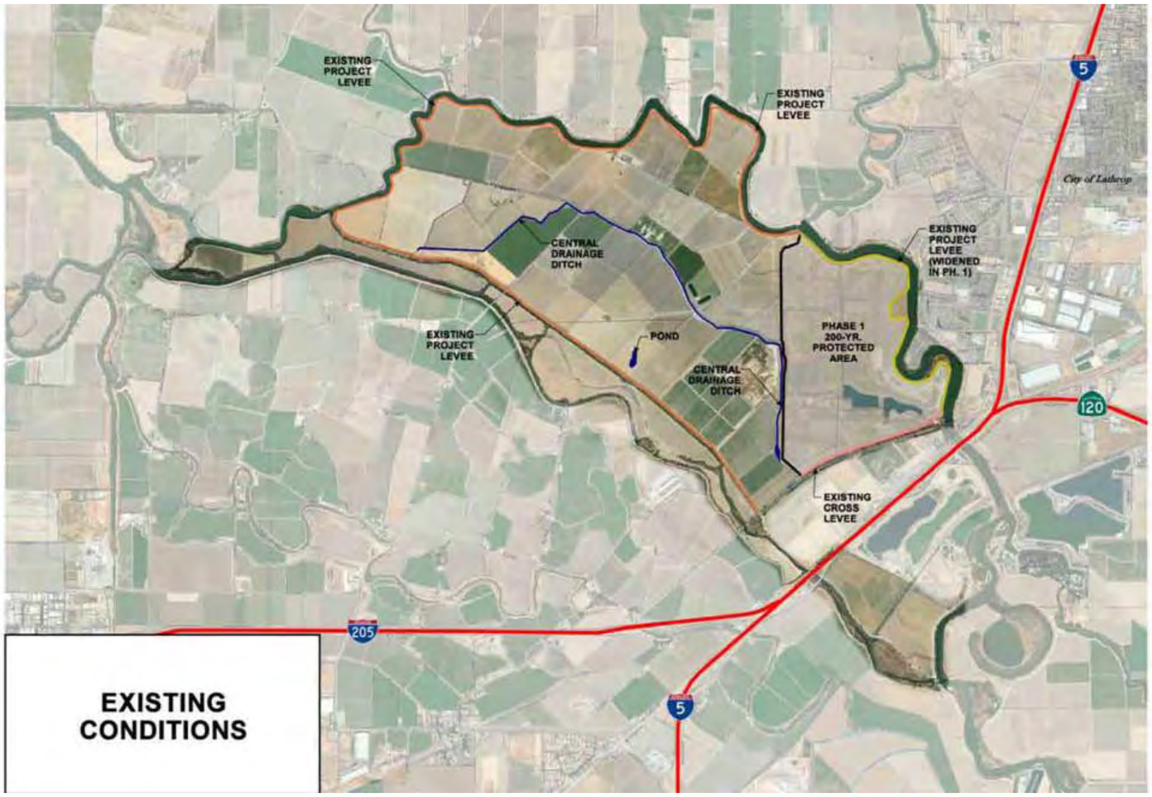


Figure 1.

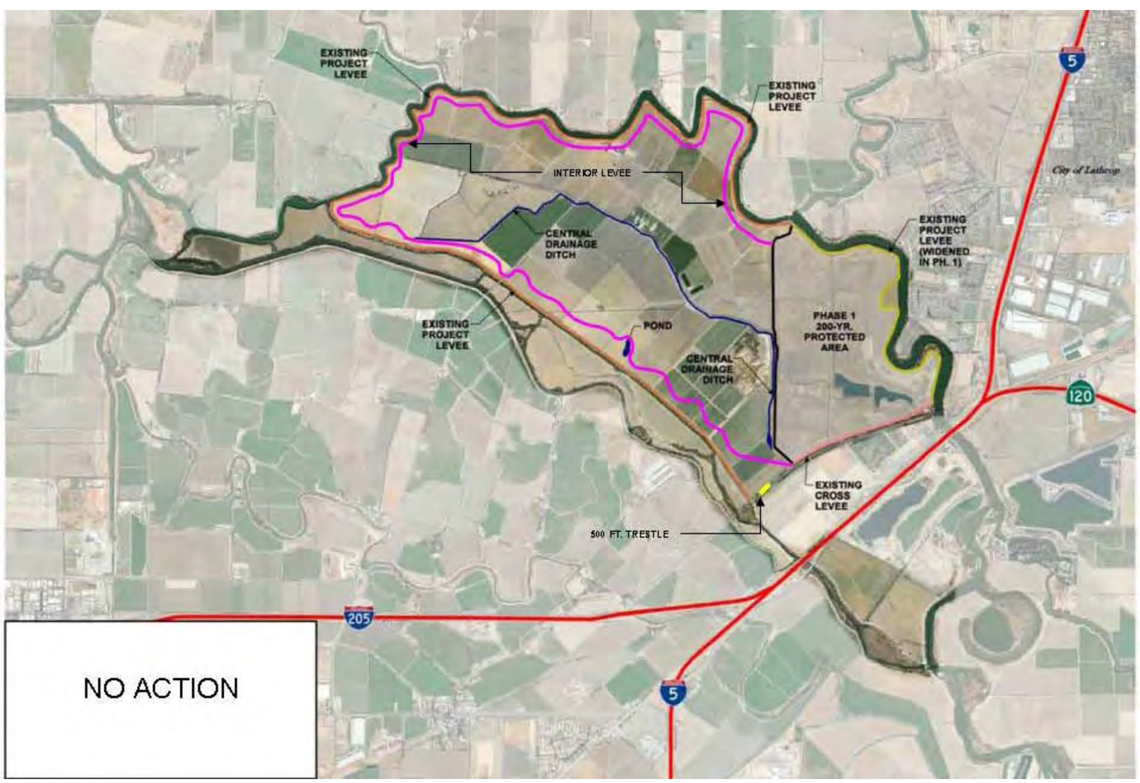


Figure 2.

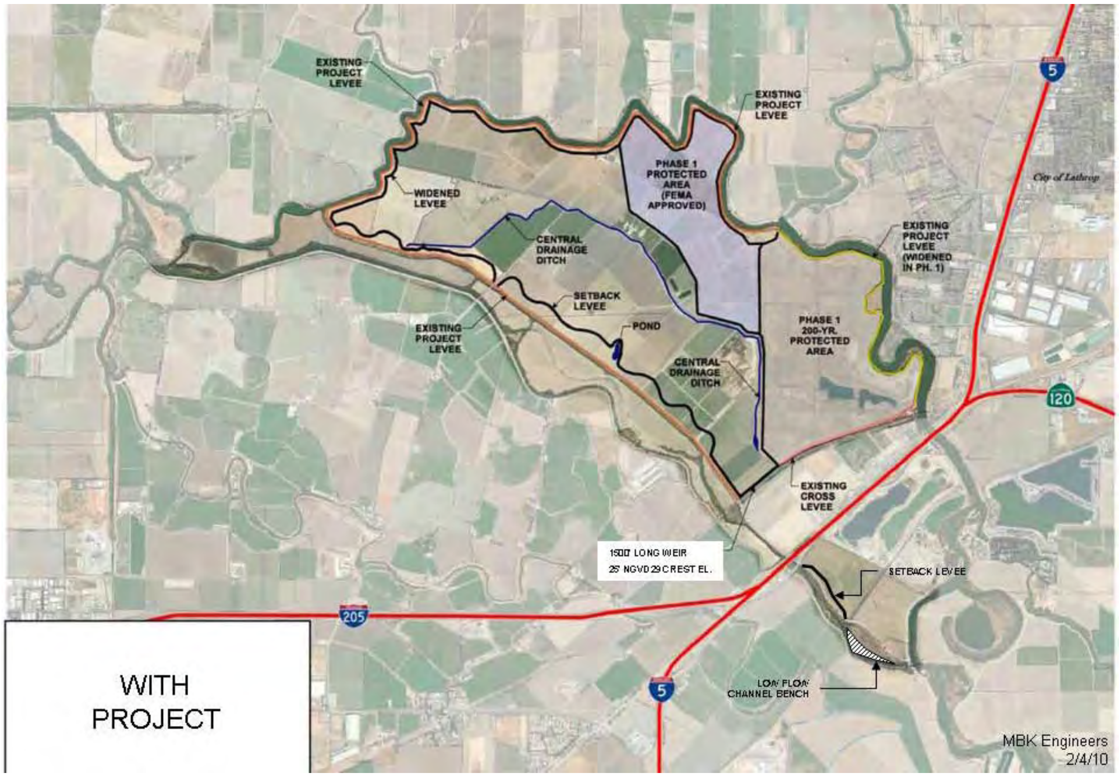


Figure 3.

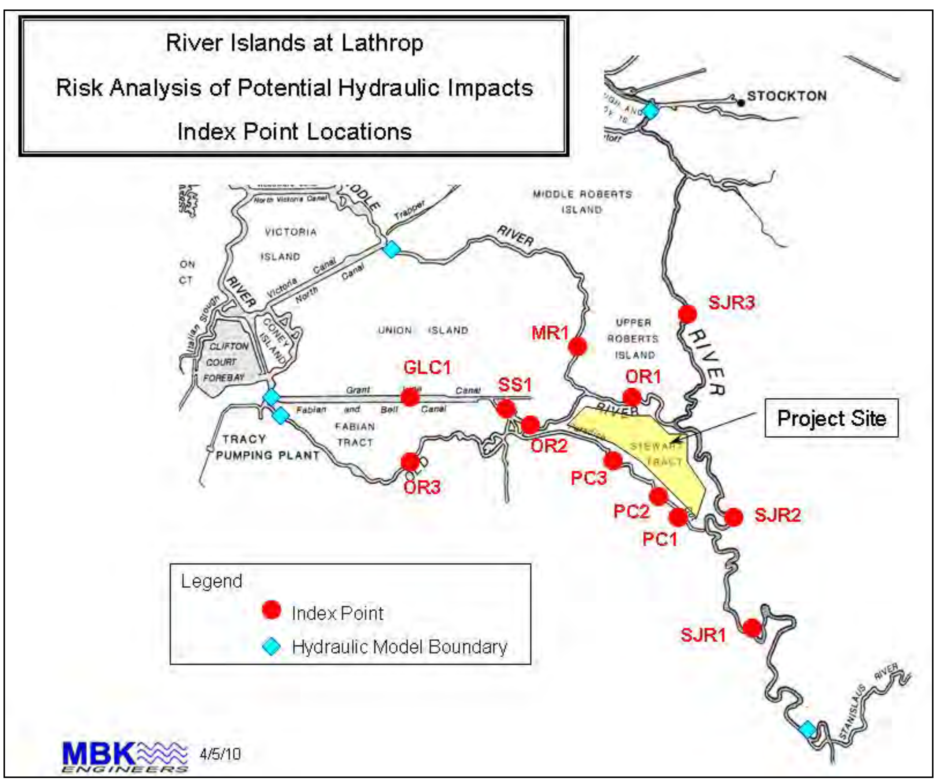


Figure 4.

Appendix B

Peak Water Surface Elevation Profile Plots
Levees Overtop Without Failing

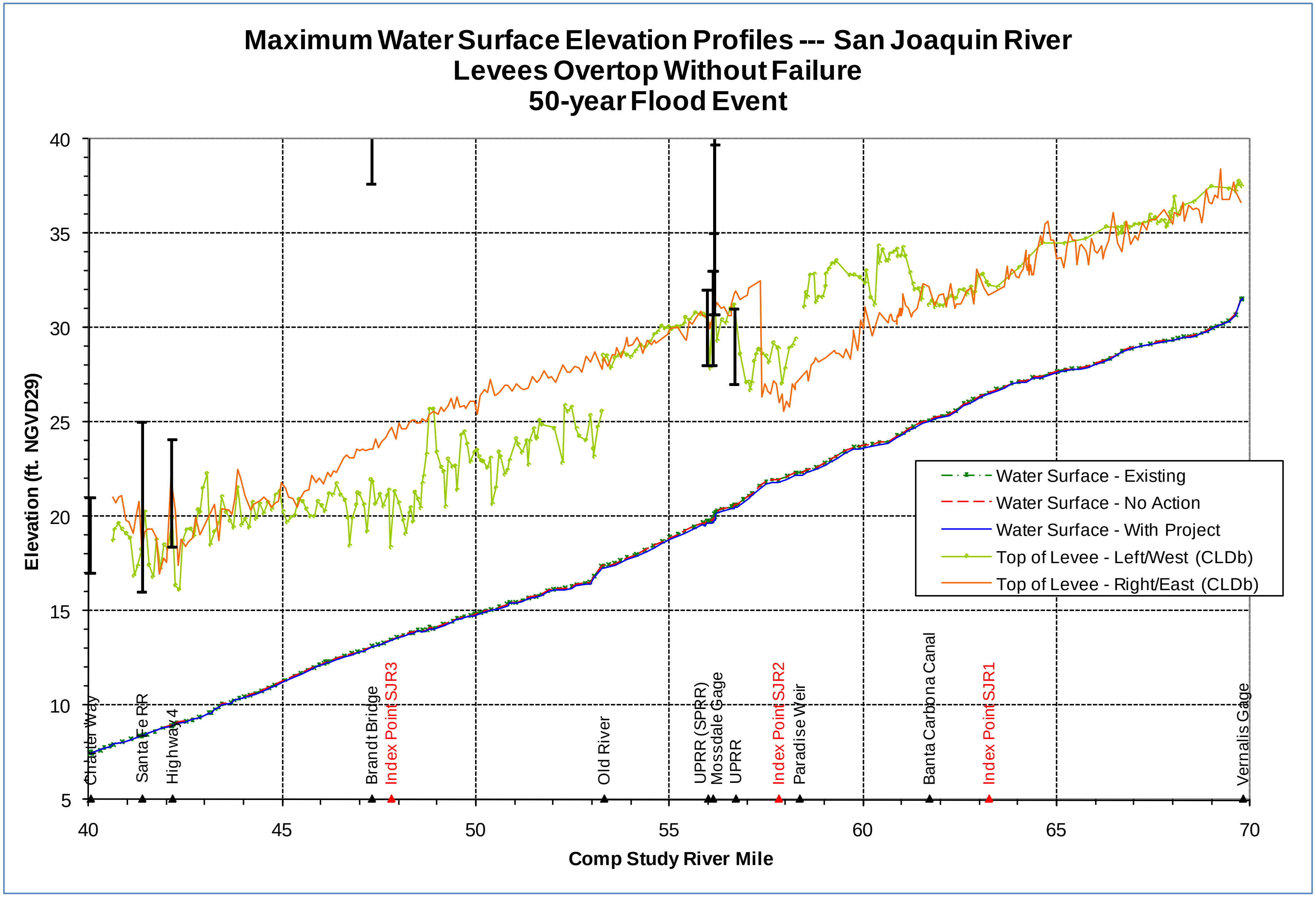
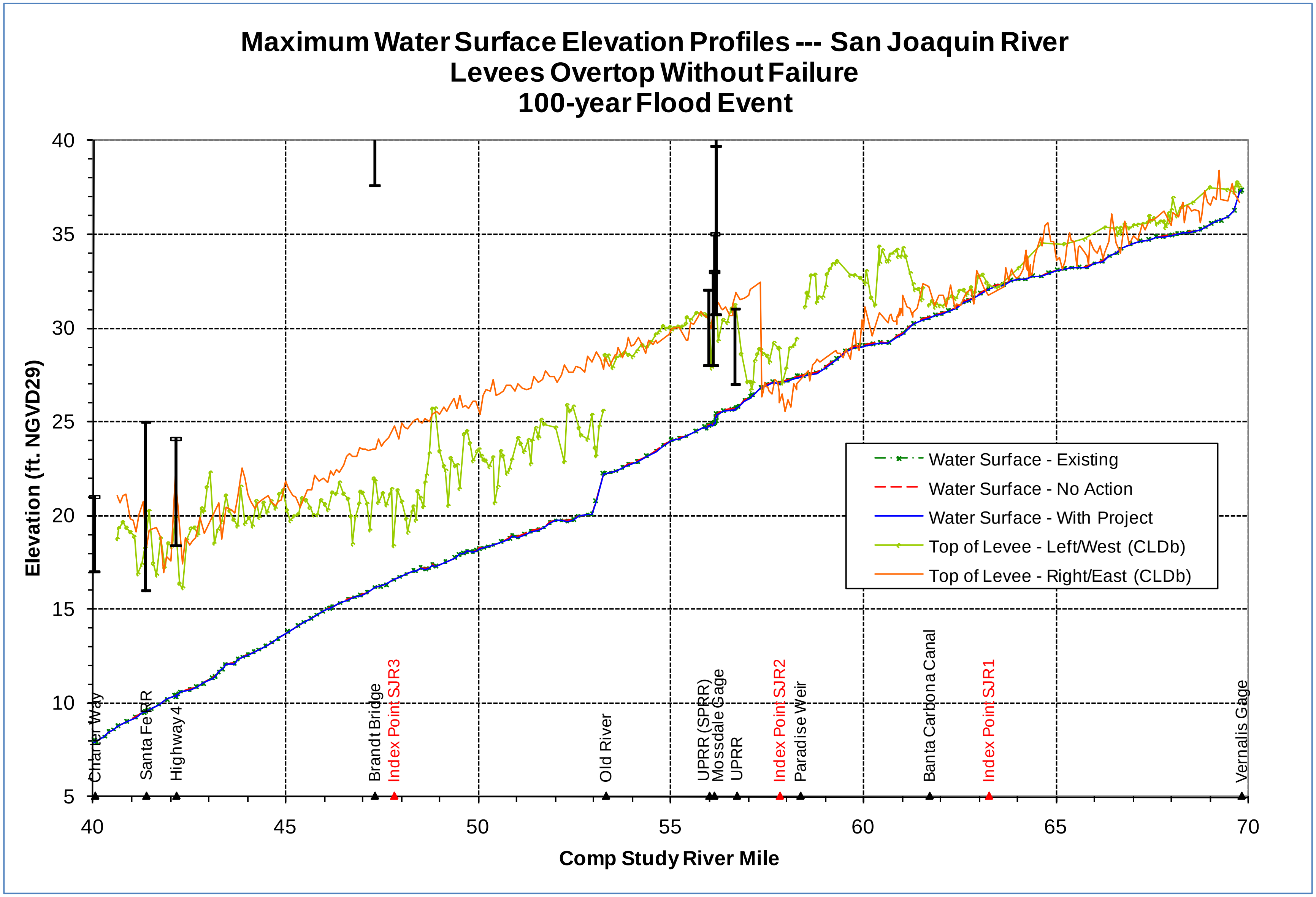

Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Overtop Without Failure
50-year Flood Event
Elevation (ft. NGVD29)
Comp Study River Mile
40
35
30
25
20
15
10
5
40
45
50
55
60
65
70
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/West (CLDb)
Top of Levee - Right/East (CLDb)
Chrater Way
Santa Fe RR
Highway 4
Brandt Bridge
Index Point SJR3
Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
Vernalis Gage

Figure B-1



Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Overtop Without Failure
100-year Flood Event
Elevation (ft. NGVD29)
Comp Study River Mile
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/West (CLDb)
Top of Levee - Right/East (CLDb)
Charter Way
Santa Fe RR
Highway 4
Brandt Bridge
Index Point SJR3
Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
Vernalis Gage

Figure B-2

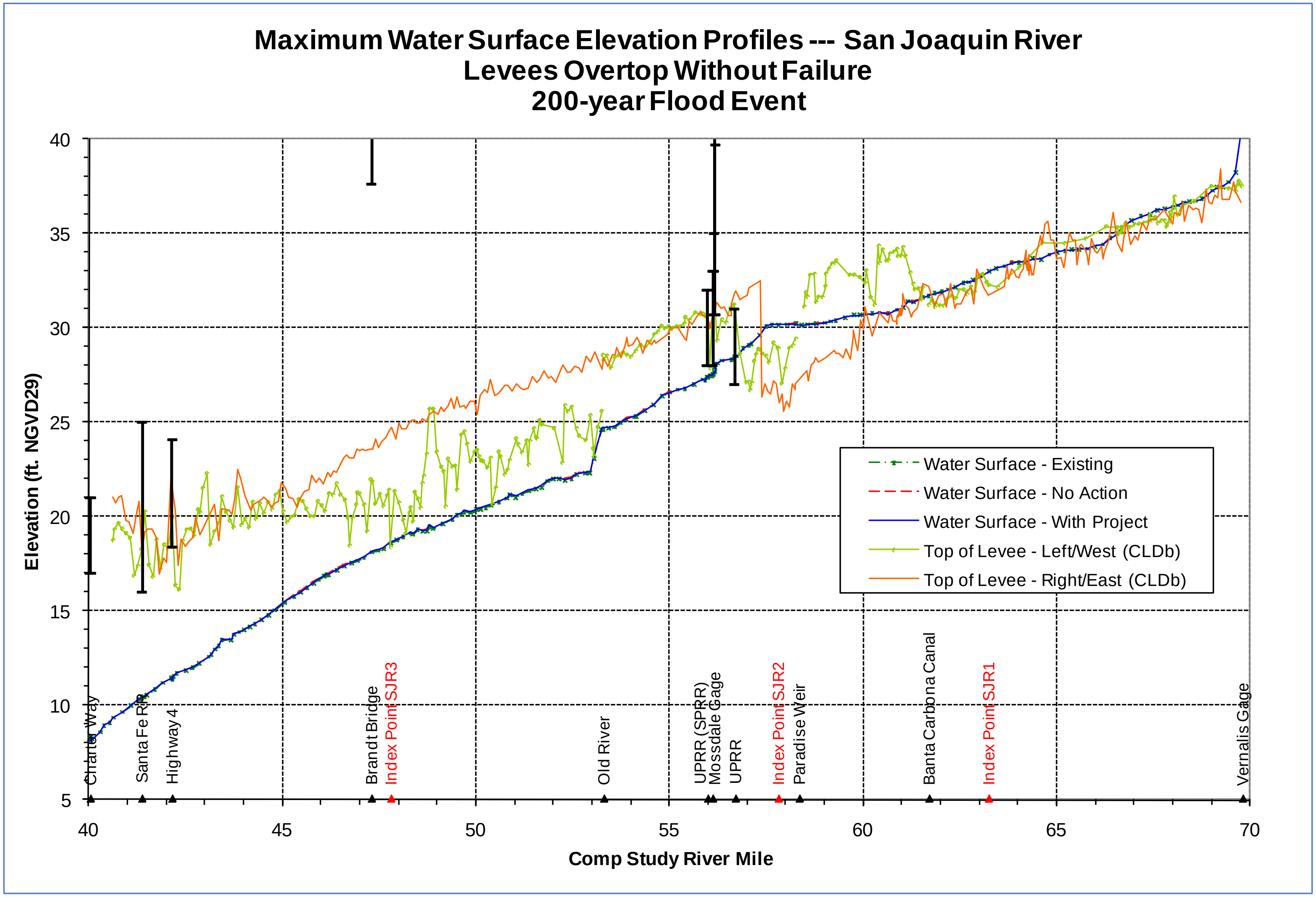
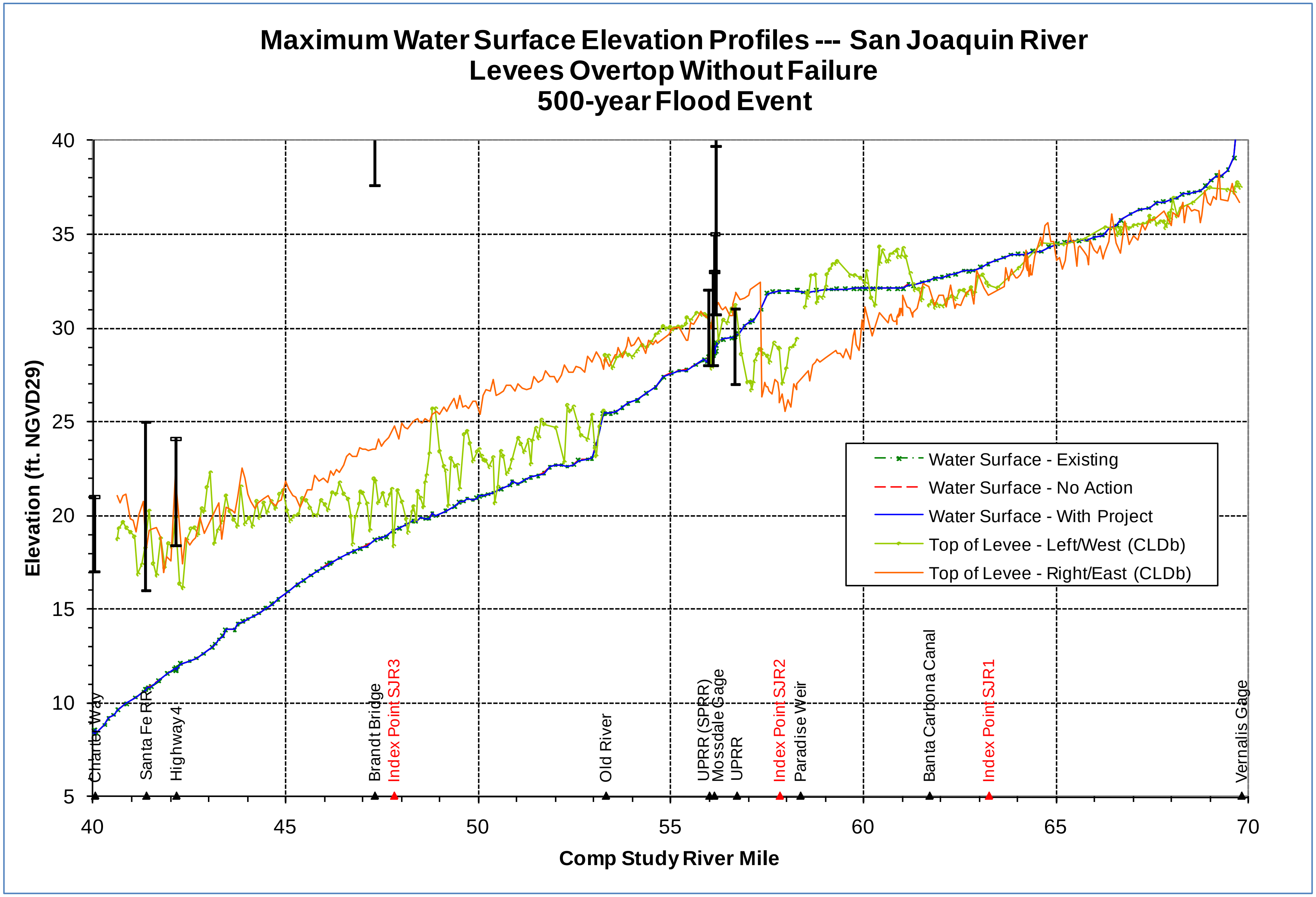

Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Overtop Without Failure
200-year Flood Event
Elevation (ft. NGVD29)
Comp Study River Mile
40
35
30
25
20
15
10
5
40
45
50
55
60
65
70
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/West (CLDb)
Top of Levee - Right/East (CLDb)
Santa Fe RR
Highway 4
Brandt Bridge
Index Point SJR3
Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
Vernalis Gage

Figure B-3



Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Overtop Without Failure
500-year Flood Event
Elevation (ft. NGVD29)
Comp Study River Mile
40
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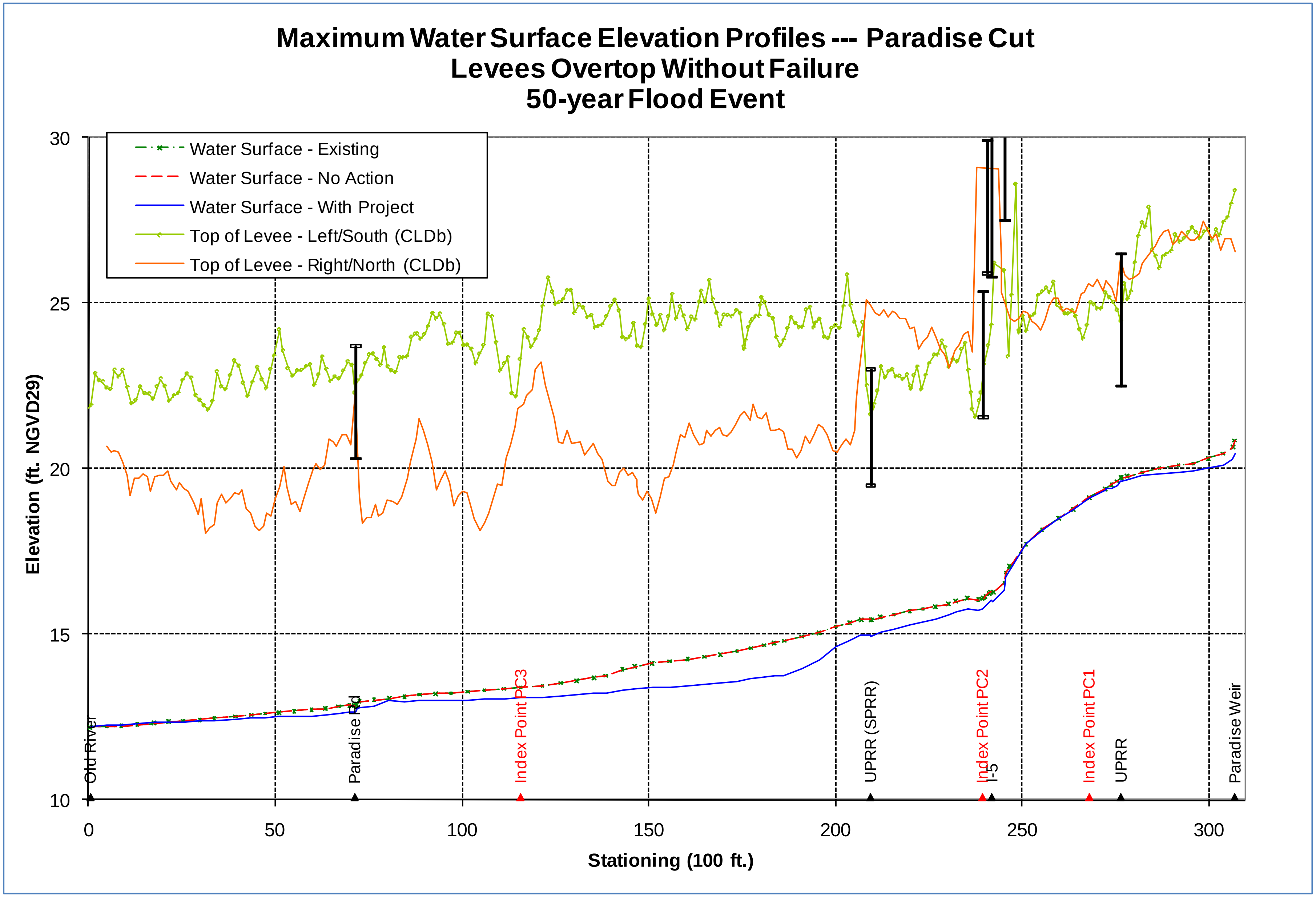
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/West (CLDb)
Top of Levee - Right/East (CLDb)
Charter Way
Santa Fe RR
Highway 4
Brandt Bridge
Index Point SJR3
Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
Vernalis Gage

Figure B-4



Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Overtop Without Failure
50-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/South (CLDb)
Top of Levee - Right/North (CLDb)
Elevation (ft. NGVD29)
Stationing (100 ft.)
30
25
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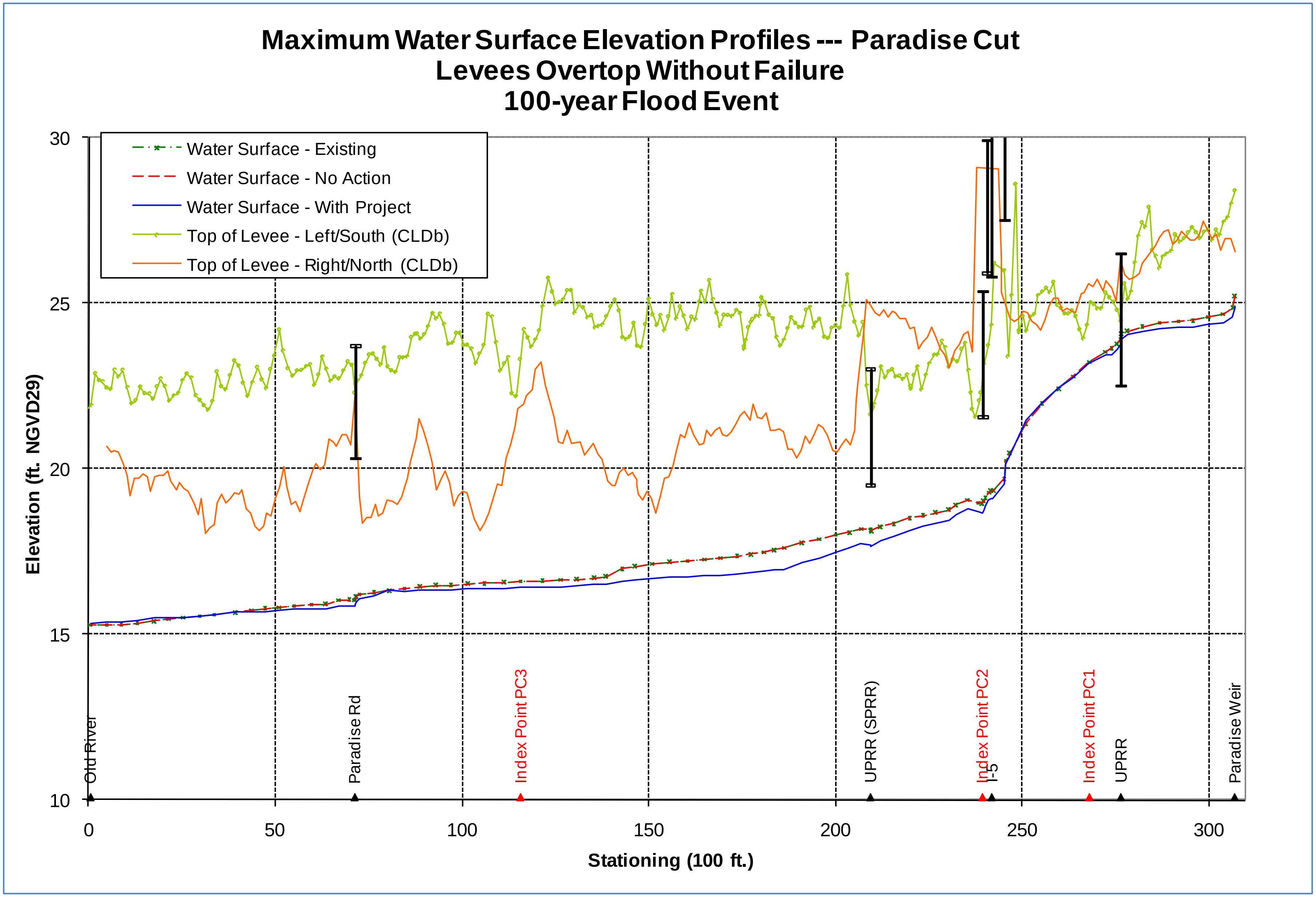
Old River
Paradise Rd
Index Point PC3
UPRR (SPRR)
Index Point PC2
I-5
Index Point PC1
UPRR
Paradise Weir

Figure B-5



Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Overtop Without Failure
100-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/South (CLDb)
Top of Levee - Right/North (CLDb)
Elevation (ft. NGVD29)
Stationing (100 ft.)
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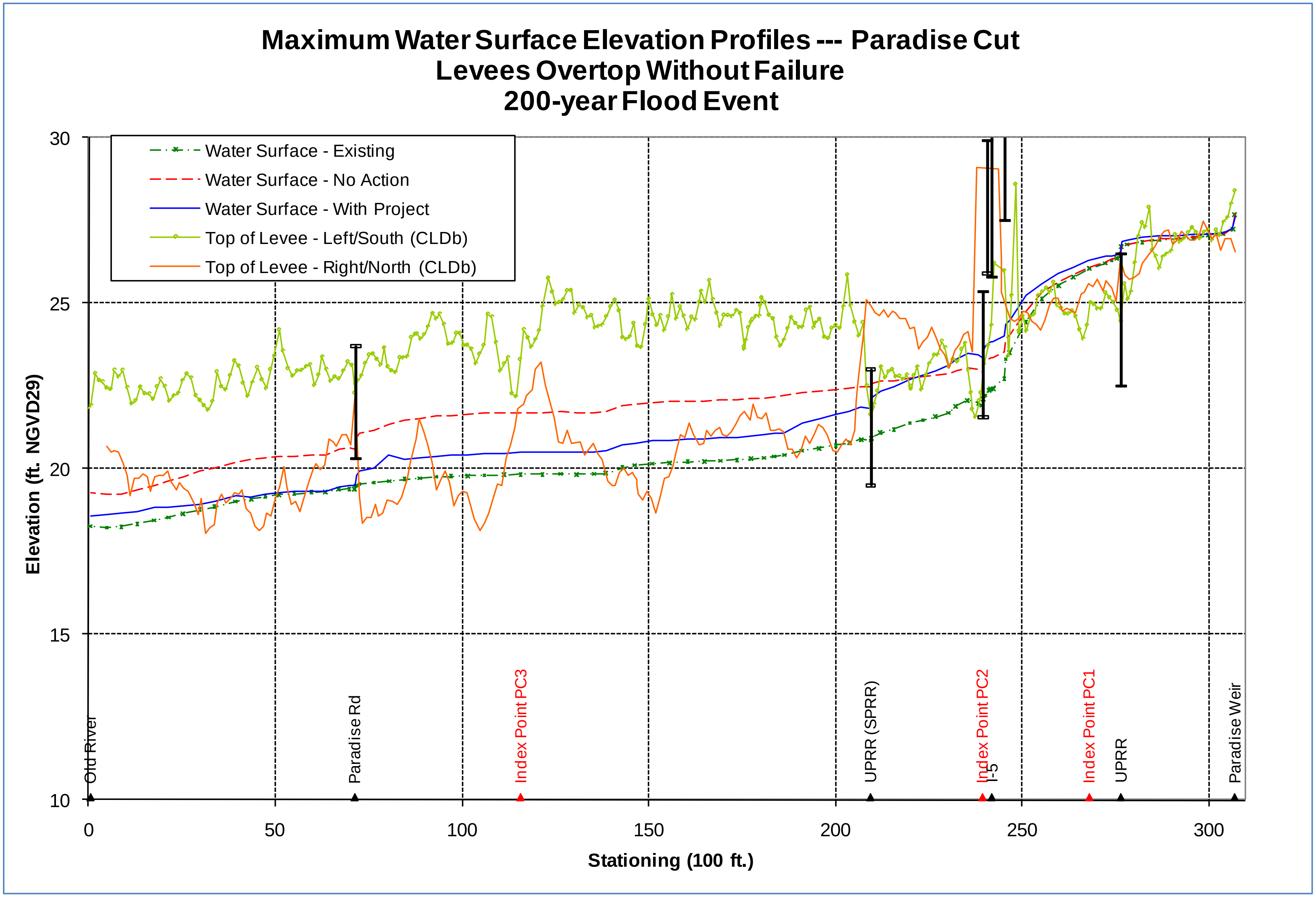
Old River
Paradise Rd
Index Point PC3
UPRR (SPRR)
Index Point PC2
I-5
Index Point PC1
UPRR
Paradise Weir

Figure B-6



Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Overtop Without Failure
200-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/South (CLDb)
Top of Levee - Right/North (CLDb)
Elevation (ft. NGVD29)
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Old River
Paradise Rd
Index Point PC3
UPRR (SPRR)
Index Point PC2
I-5
Index Point PC1
UPRR
Paradise Weir
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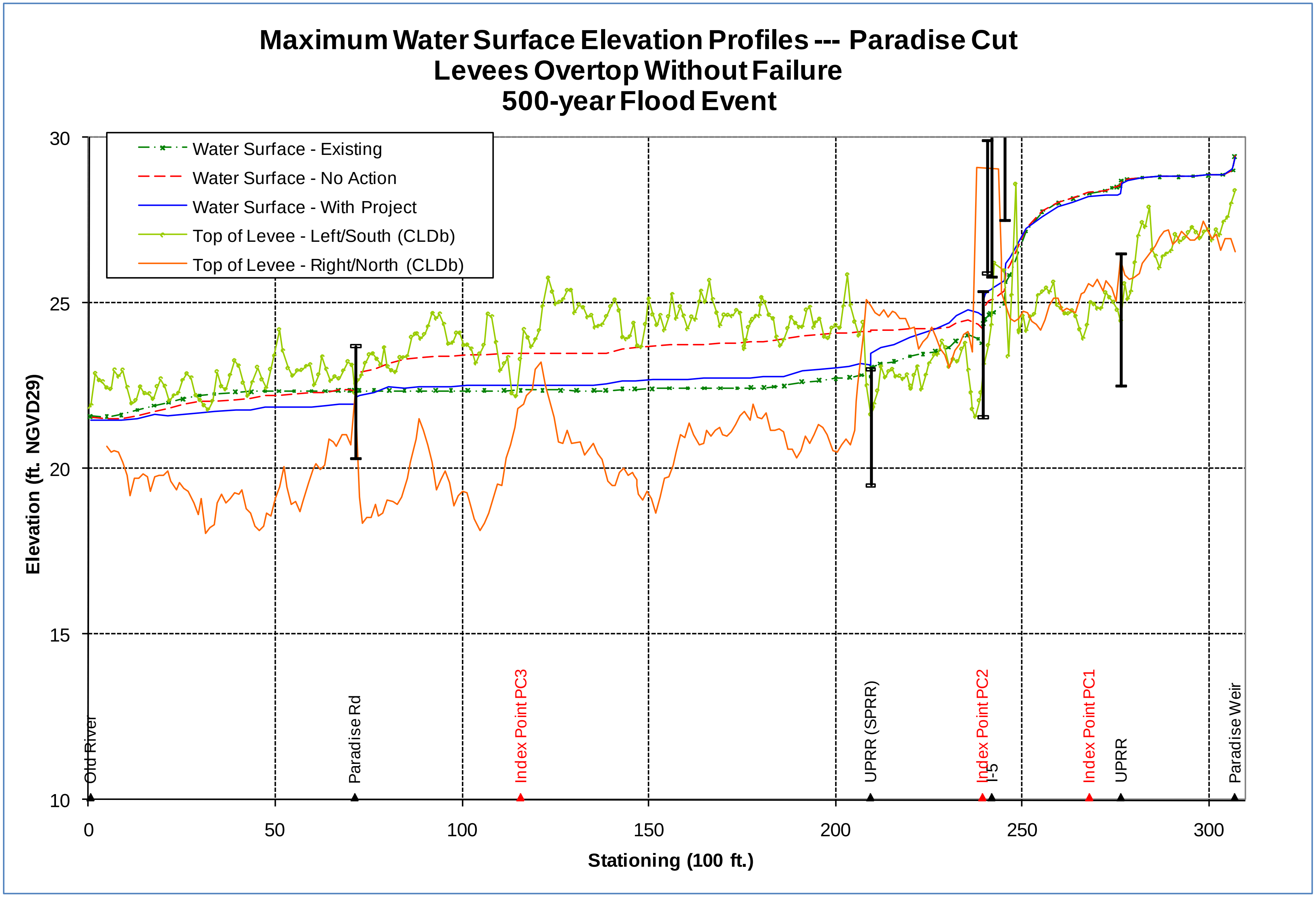
200
250
300
Stationing (100 ft.)

Figure B-7


Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Overtop Without Failure
500-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/South (CLDb)
Top of Levee - Right/North (CLDb)
Elevation (ft. NGVD29)
Stationing (100 ft.)
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Old River
Paradise Rd
Index Point PC3
UPRR (SPRR)
Index Point PC2
I-5
Index Point PC1
UPRR
Paradise Weir

Figure B-8

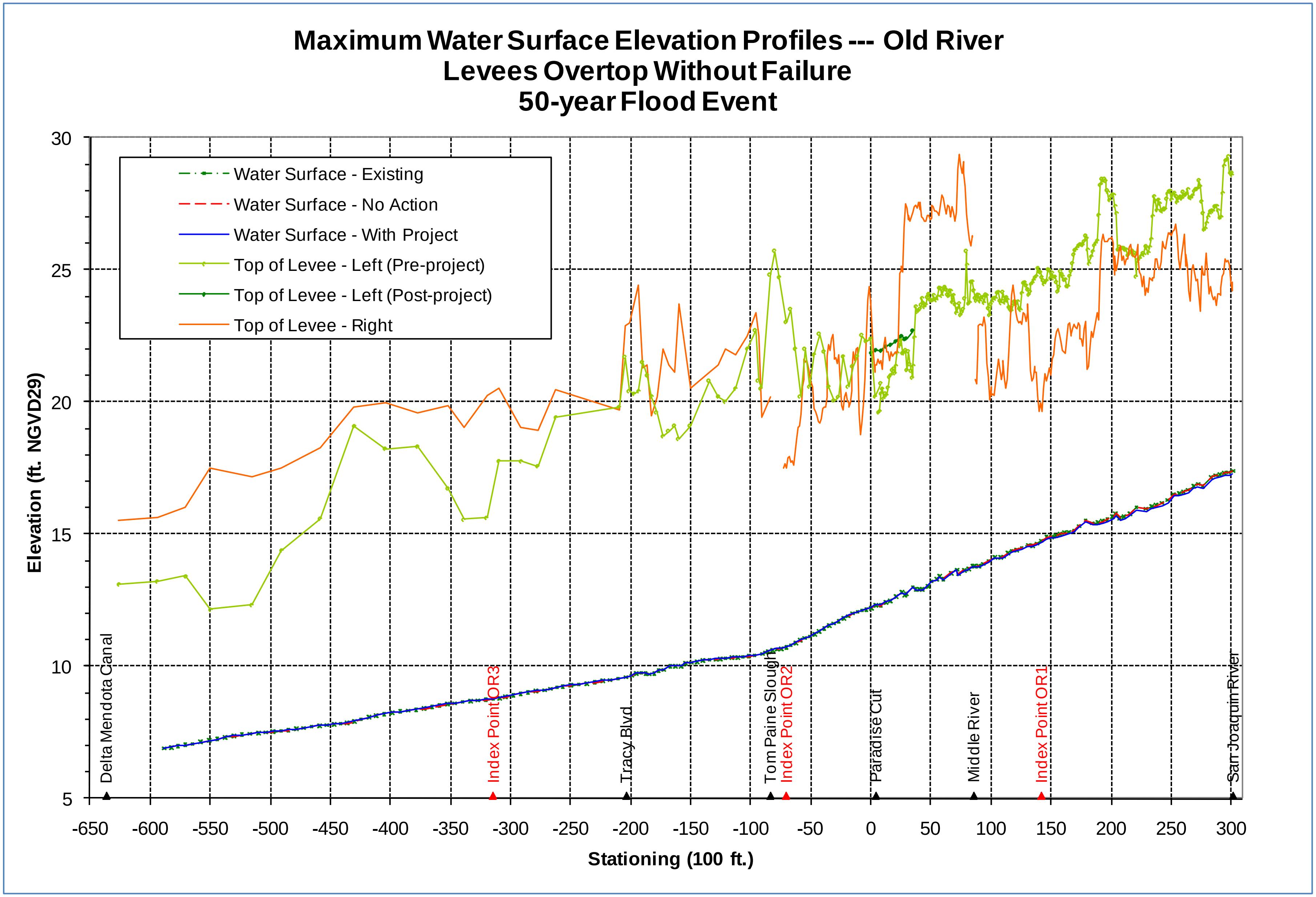
Maximum Water Surface Elevation Profiles --- Old River
Levees Overtop Without Failure
50-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left (Pre-project)
Top of Levee - Left (Post-project)
Top of Levee - Right
Elevation (ft. NGVD29)
Stationing (100 ft.)
Delta Mendota Canal
Index Point OR3
Tracy Blvd
Tom Paine Slough
Index Point OR2
Paradise Cut
Middle River
Index Point OR1
San Joaquin River
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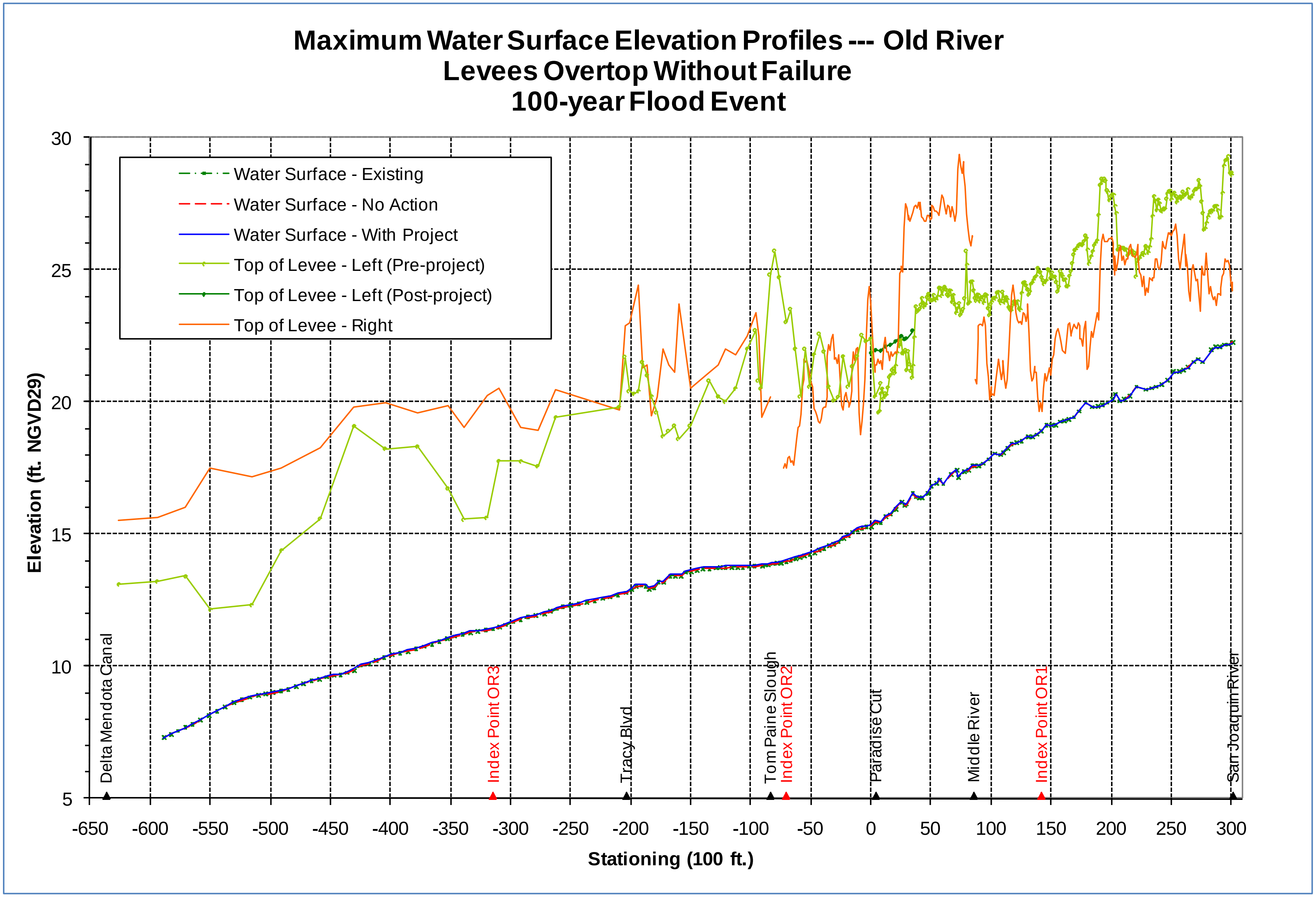
Figure B-9



Maximum Water Surface Elevation Profiles --- Old River
Levees Overtop Without Failure
100-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left (Pre-project)
Top of Levee - Left (Post-project)
Top of Levee - Right
Elevation (ft. NGVD29)
Stationing (100 ft.)
Delta Mendota Canal
Index Point OR3
Tracy Blvd
Tom Paine Slough
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Paradise Cut
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Index Point OR1
San Joaquin River
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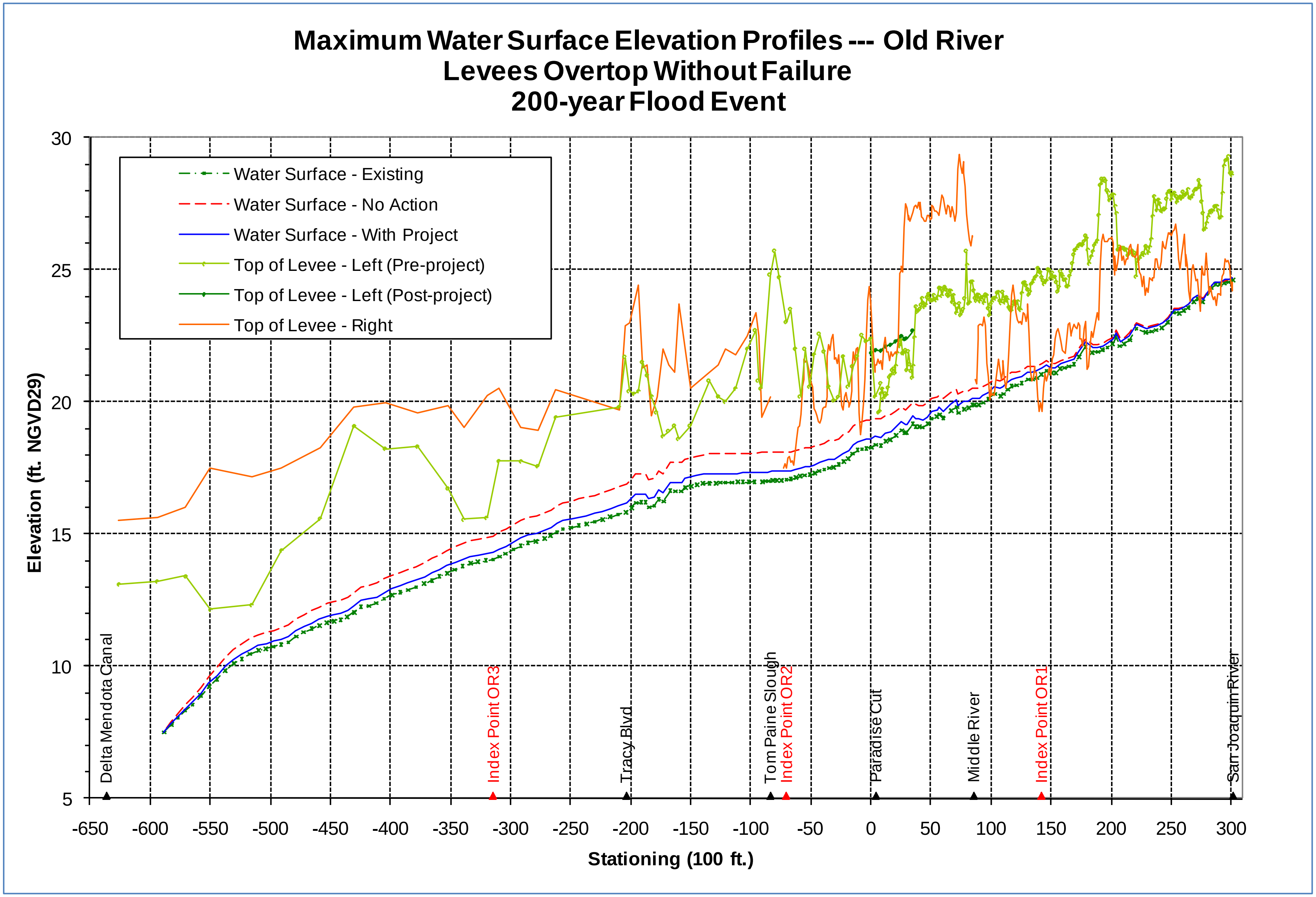
Figure B-10



Maximum Water Surface Elevation Profiles --- Old River
Levees Overtop Without Failure
200-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left (Pre-project)
Top of Levee - Left (Post-project)
Top of Levee - Right
Elevation (ft. NGVD29)
Stationing (100 ft.)
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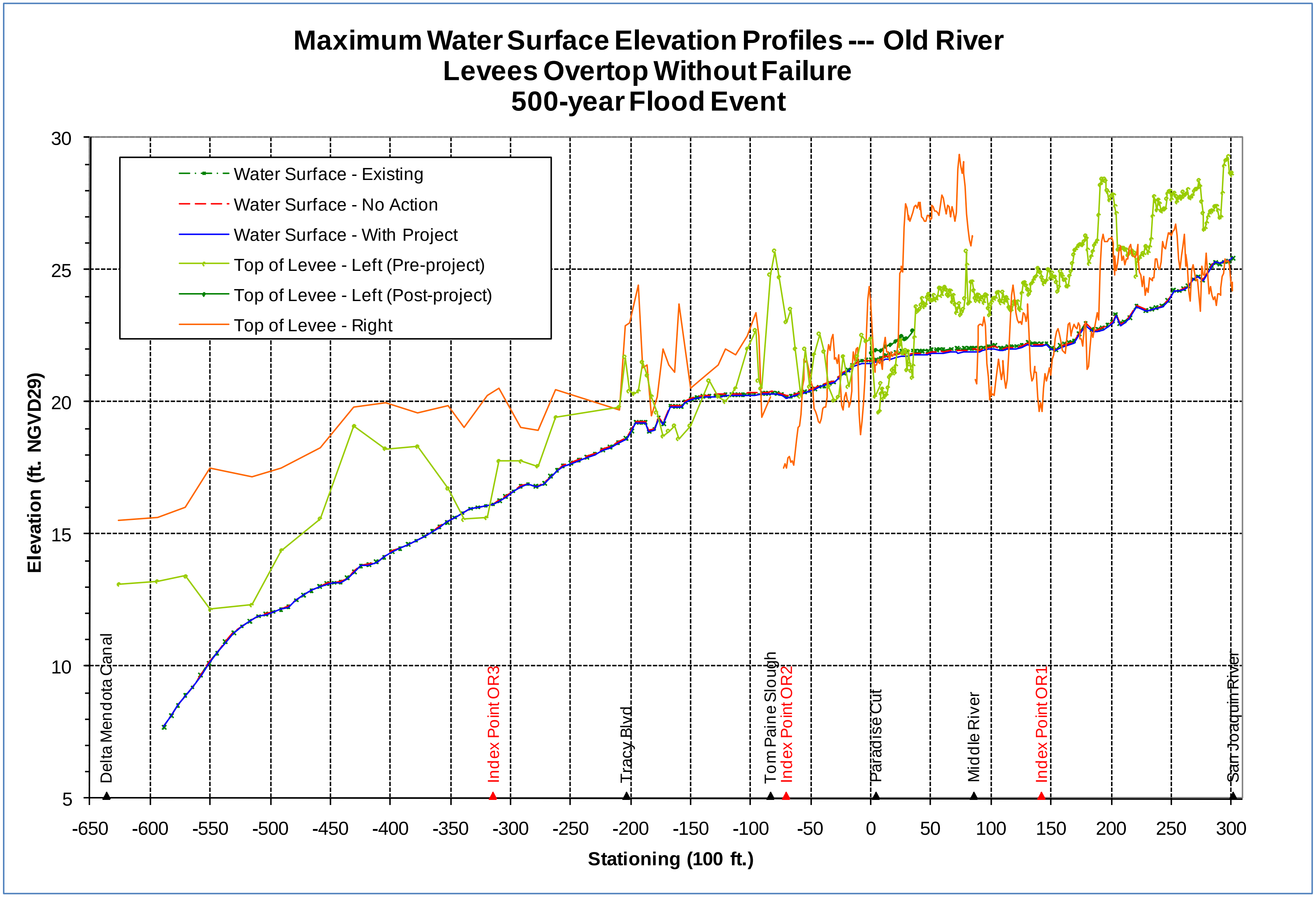
Delta Mendota Canal
Index Point OR3
Tracy Blvd
Tom Paine Slough
Index Point OR2
Paradise Cut
Middle River
Index Point OR1
San Joaquin River

Figure B-11



Maximum Water Surface Elevation Profiles --- Old River
Levees Overtop Without Failure
500-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left (Pre-project)
Top of Levee - Left (Post-project)
Top of Levee - Right
Elevation (ft. NGVD29)
Stationing (100 ft.)
Delta Mendota Canal
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Figure B-12

Appendix C

Peak Water Surface Elevation Profile Plots
Levees Breach when Water Reaches Top of Levee

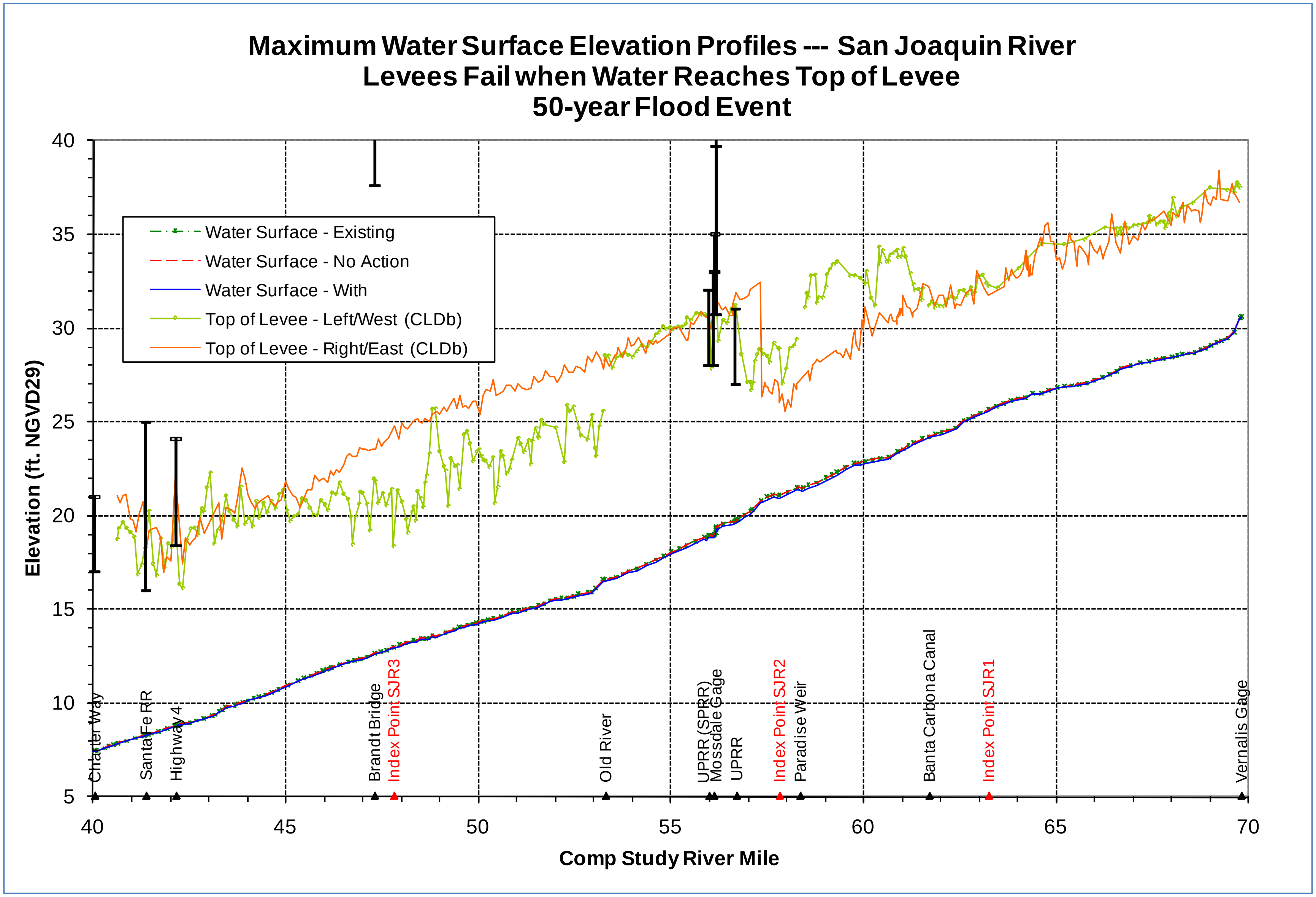
Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Fail when Water Reaches Top of Levee
50-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With
Top of Levee - Left/West (CLDb)
Top of Levee - Right/East (CLDb)
Elevation (ft. NGVD29)
Comp Study River Mile
Charter Way
Santa Fe RR
Highway 4
Brandt Bridge
Index Point SJR3
Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
Vernalis Gage
40
35
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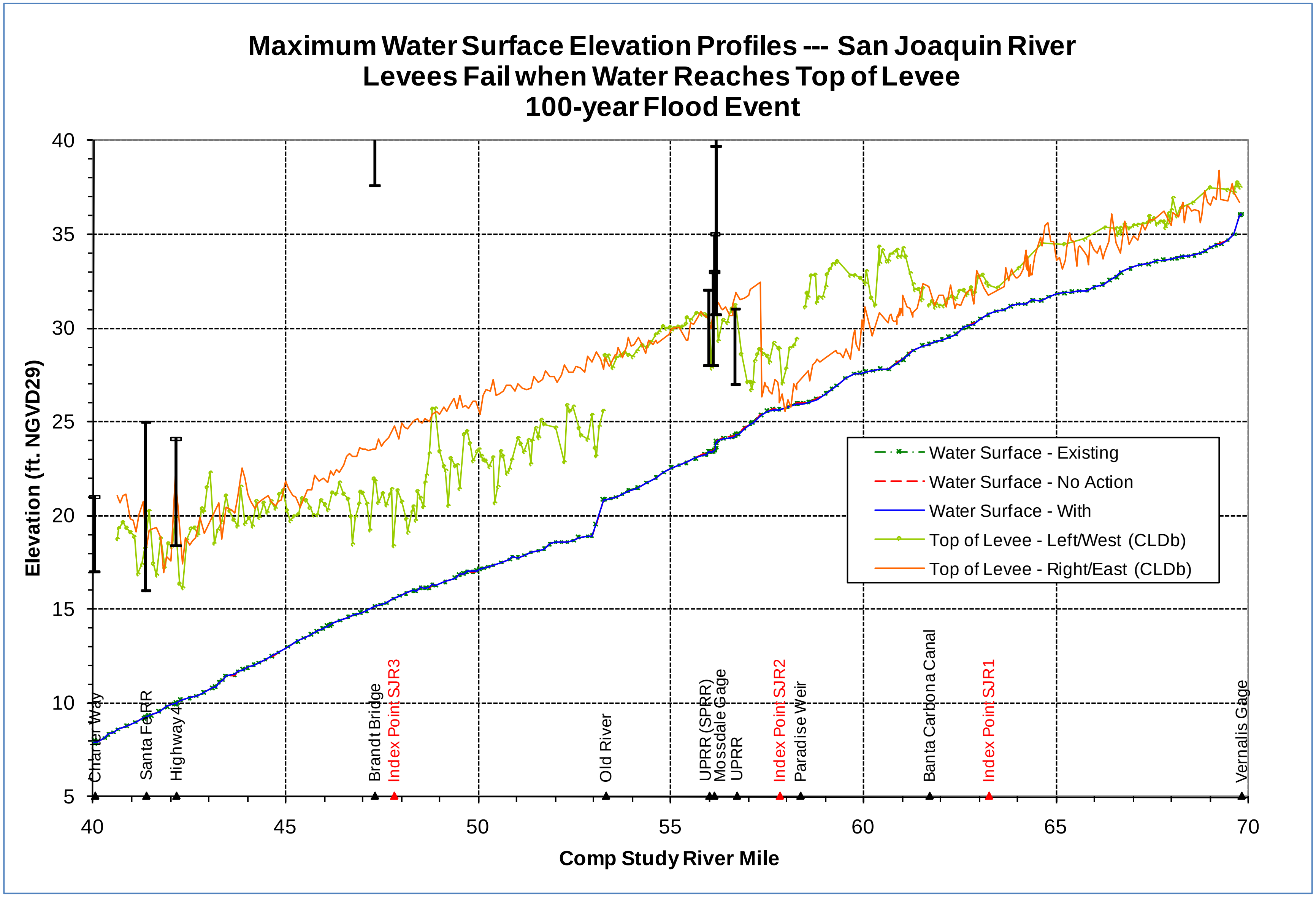
Figure C-1



Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Fail when Water Reaches Top of Levee
100-year Flood Event
Elevation (ft. NGVD29)
Comp Study River Mile
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Water Surface - Existing
Water Surface - No Action
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Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
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Figure C-2

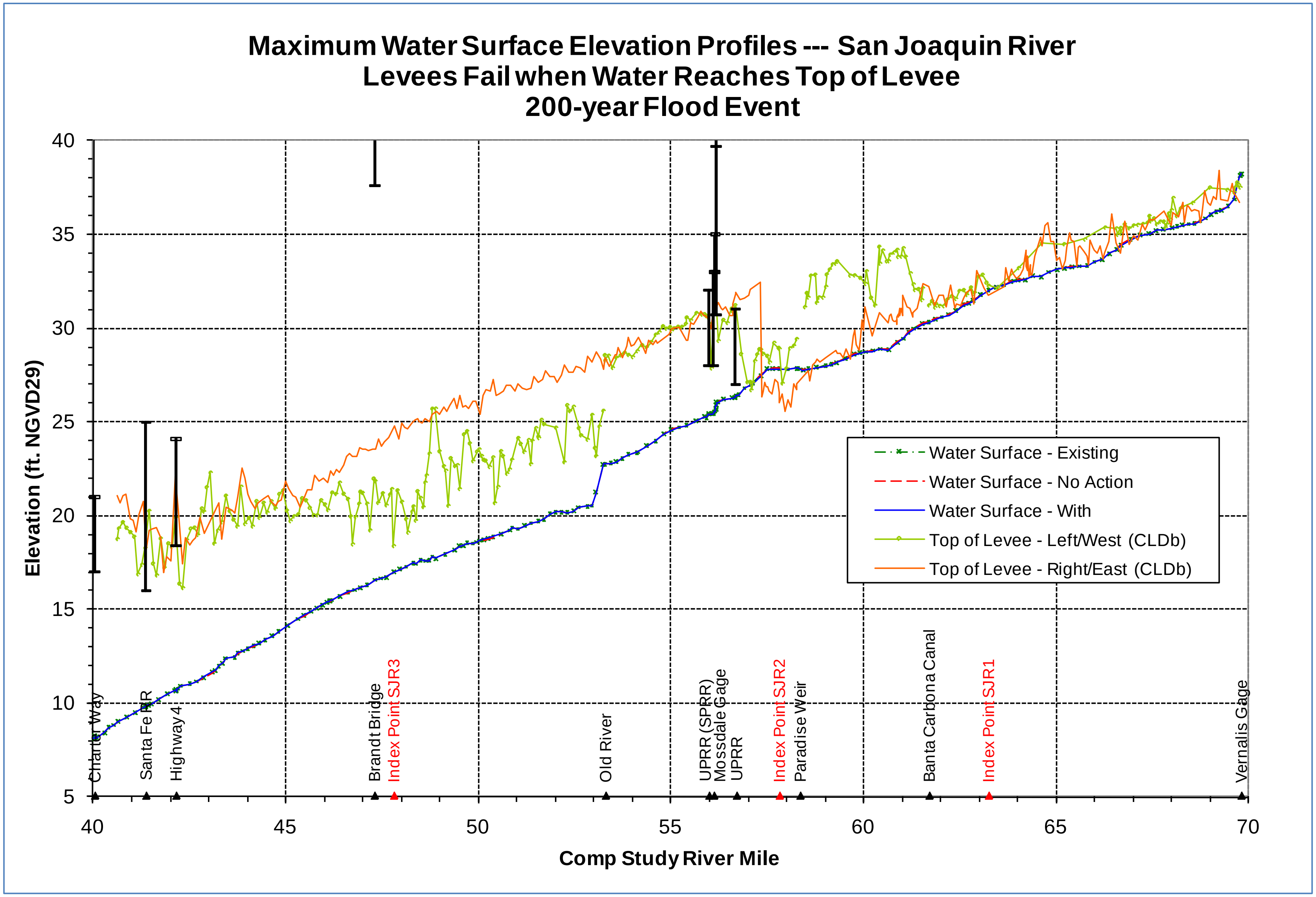
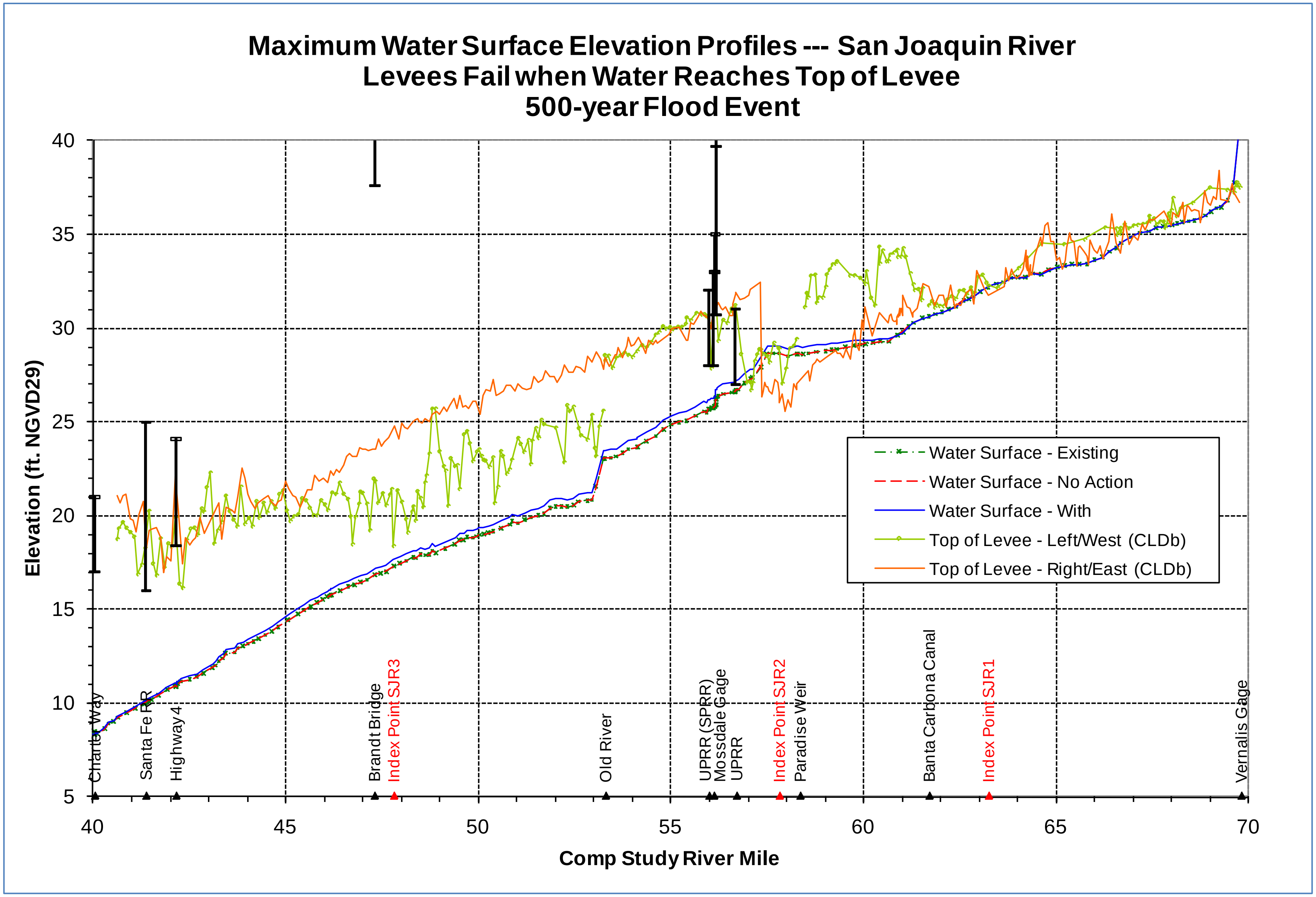

Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Fail when Water Reaches Top of Levee
200-year Flood Event
Elevation (ft. NGVD29)
Comp Study River Mile
Water Surface - Existing
Water Surface - No Action
Water Surface - With
Top of Levee - Left/West (CLDb)
Top of Levee - Right/East (CLDb)
Charter Way
Santa Fe RR
Highway 4
Brandt Bridge
Index Point SJR3
Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
Vernalis Gage

Figure C-3



Maximum Water Surface Elevation Profiles --- San Joaquin River
Levees Fail when Water Reaches Top of Levee
500-year Flood Event
Elevation (ft. NGVD29)
Comp Study River Mile
40
35
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25
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40
45
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55
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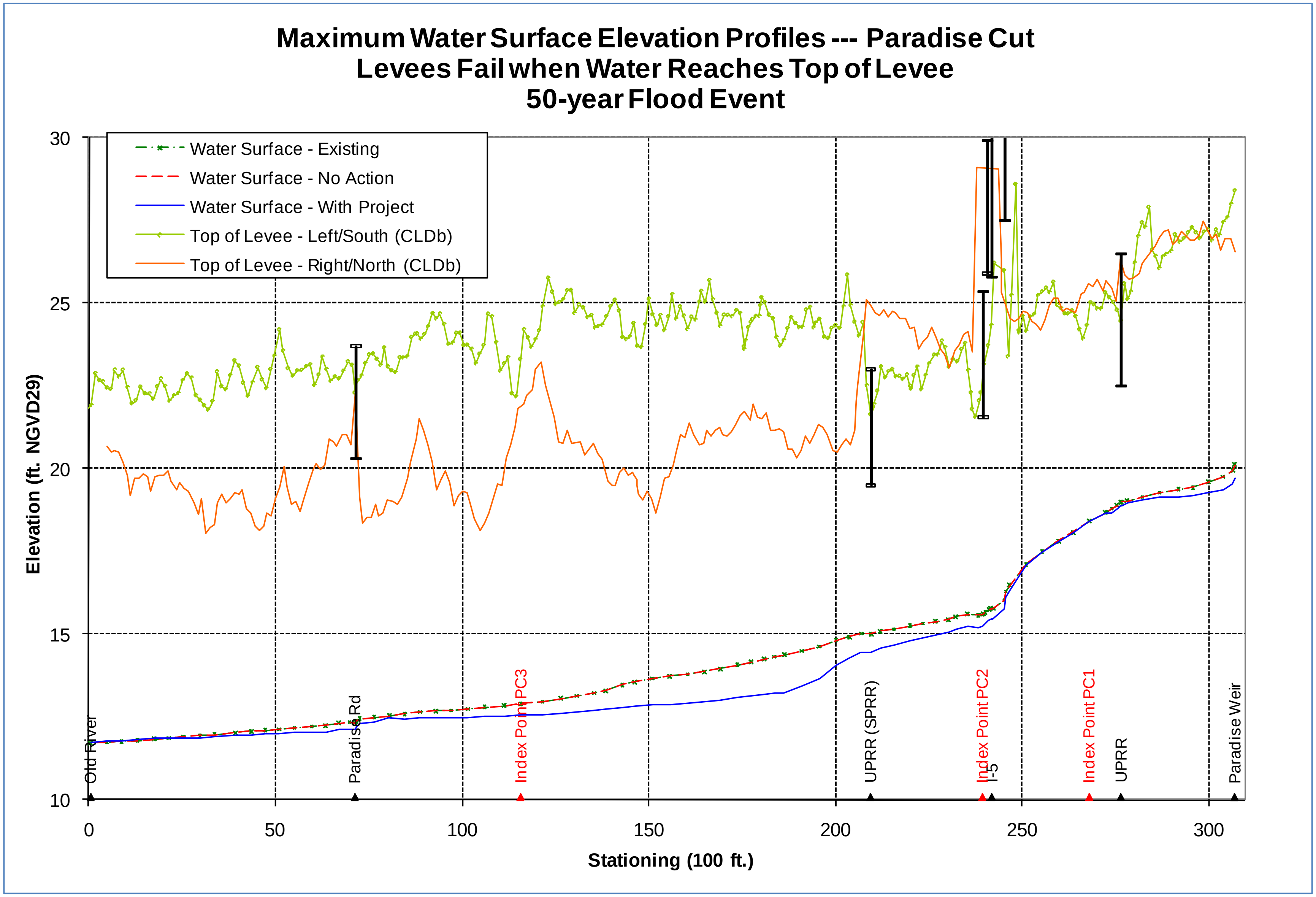
65
70
Water Surface - Existing
Water Surface - No Action
Water Surface - With
Top of Levee - Left/West (CLDb)
Top of Levee - Right/East (CLDb)
Charter Way
Santa Fe RR
Highway 4
Brandt Bridge
Index Point SJR3
Old River
UPRR (SPRR)
Mossdale Gage
UPRR
Index Point SJR2
Paradise Weir
Banta Carbona Canal
Index Point SJR1
Vernalis Gage

Figure C-4



Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Fail when Water Reaches Top of Levee
50-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/South (CLDb)
Top of Levee - Right/North (CLDb)
Elevation (ft. NGVD29)
30
25
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10
0
50
100
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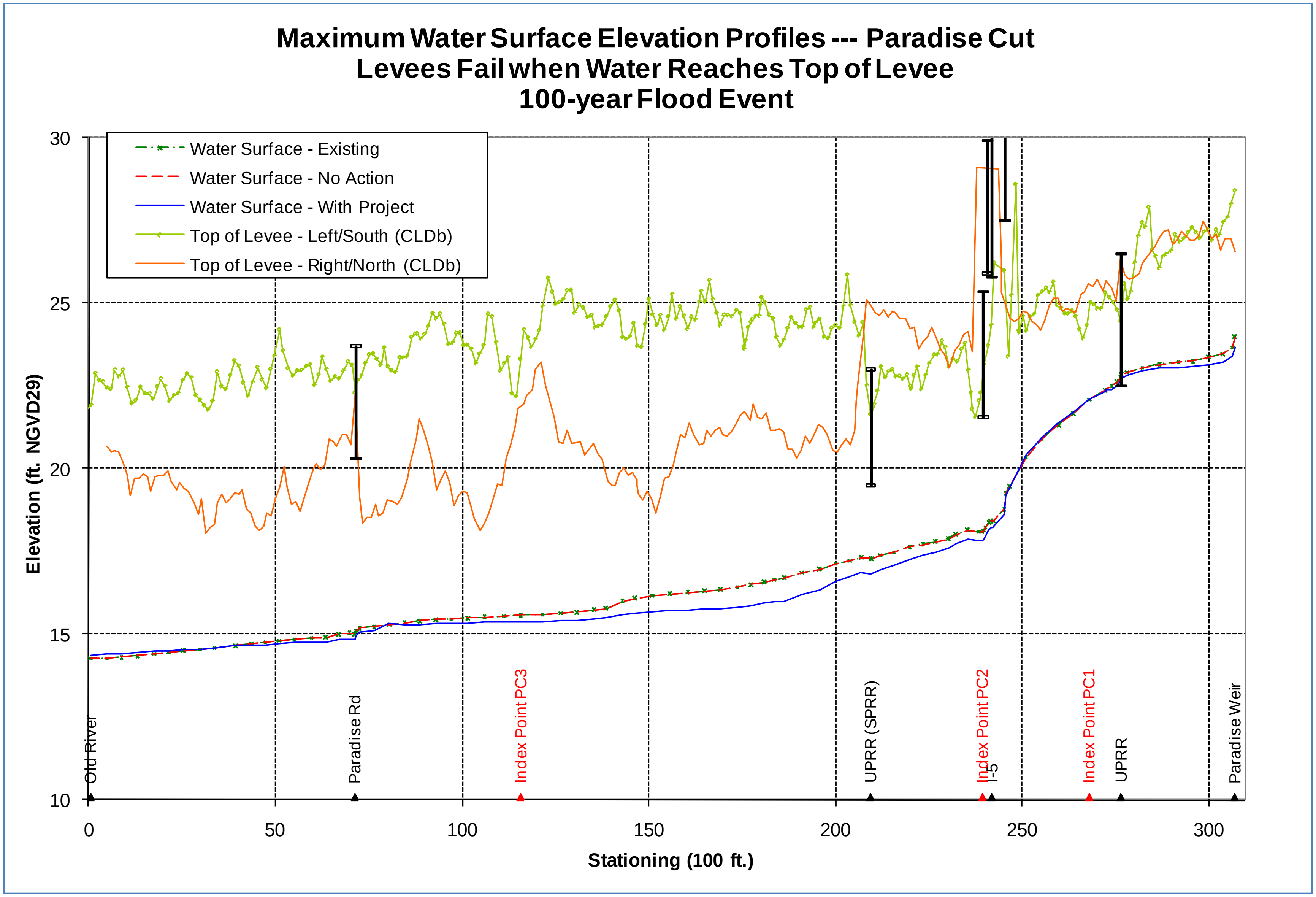
250
300
Stationing (100 ft.)
Old River
Paradise Rd
Index Point PC3
UPRR (SPRR)
Index Point PC2
I-5
Index Point PC1
UPRR
Paradise Weir

Figure C-5



Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Fail when Water Reaches Top of Levee
100-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left/South (CLDb)
Top of Levee - Right/North (CLDb)
Elevation (ft. NGVD29)
Stationing (100 ft.)
10
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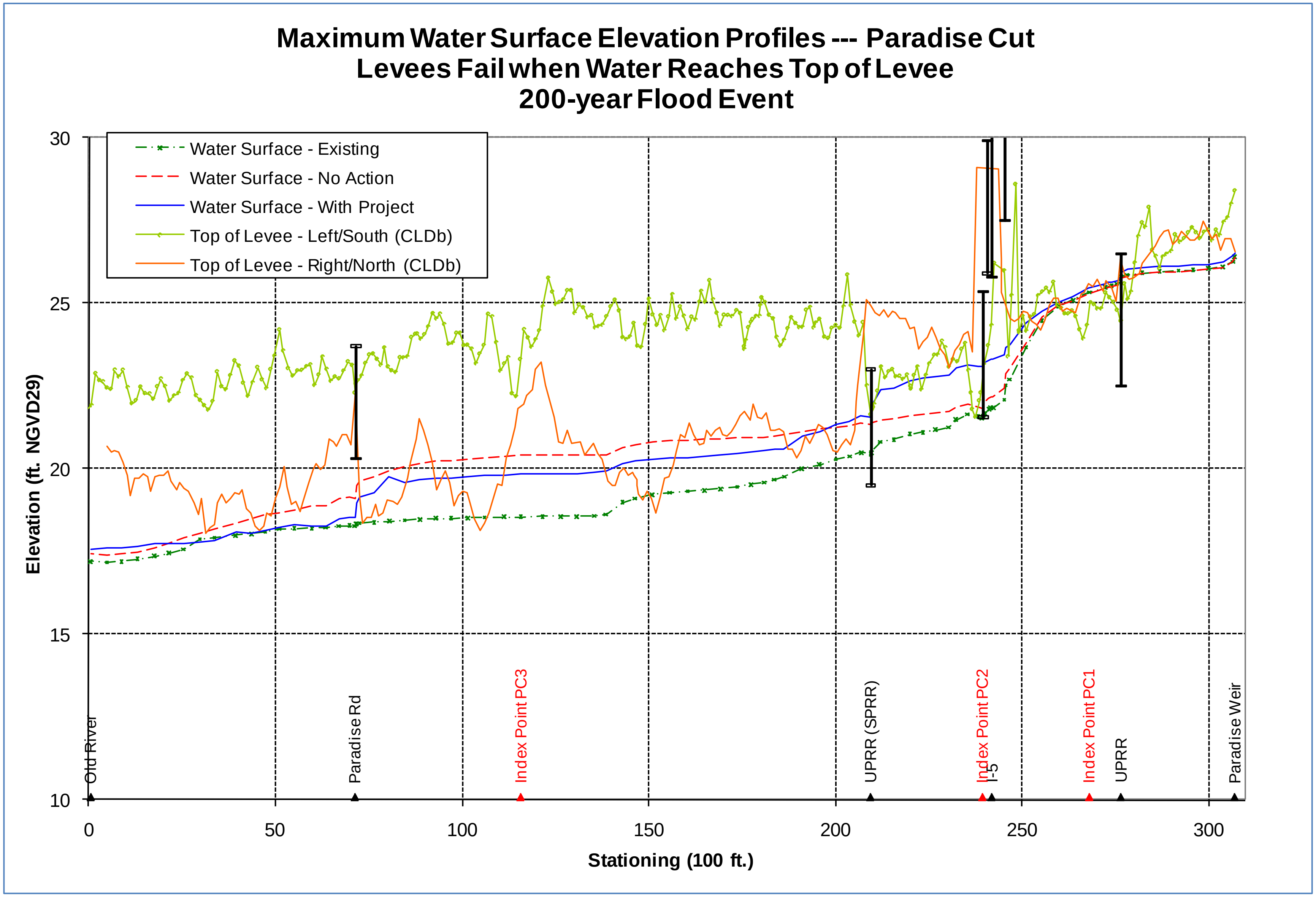
150
200
250
300
Old River
Paradise Rd
Index Point PC3
UPRR (SPRR)
Index Point PC2
I-5
Index Point PC1
UPRR
Paradise Weir

Figure C-6



Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Fail when Water Reaches Top of Levee
200-year Flood Event
Water Surface - Existing
Water Surface - No Action
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Paradise Weir
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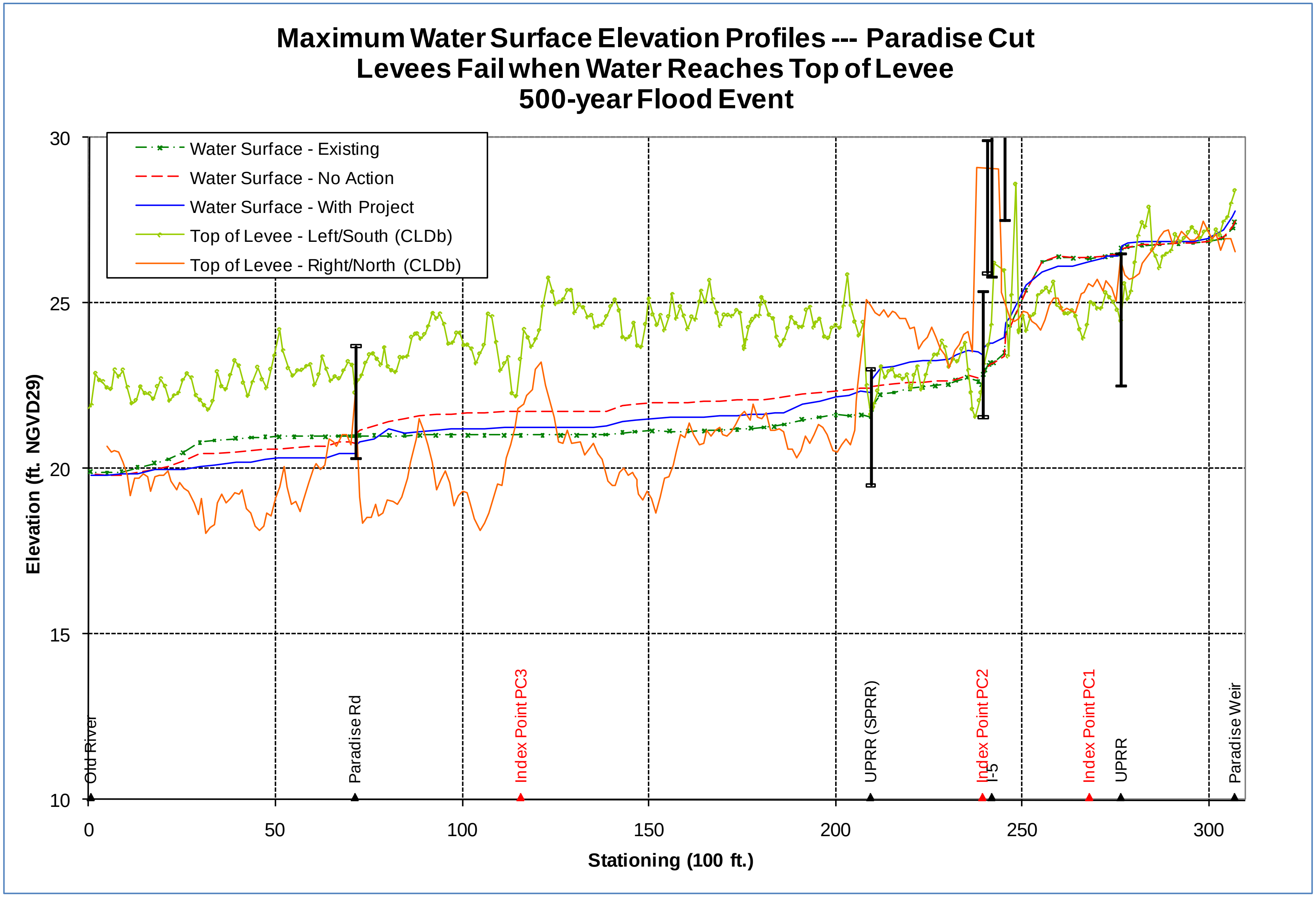
Figure C-7


Maximum Water Surface Elevation Profiles --- Paradise Cut
Levees Fail when Water Reaches Top of Levee
500-year Flood Event
Water Surface - Existing
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Water Surface - With Project
Top of Levee - Left/South (CLDb)
Top of Levee - Right/North (CLDb)
Elevation (ft. NGVD29)
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Stationing (100 ft.)
Old River
Paradise Rd
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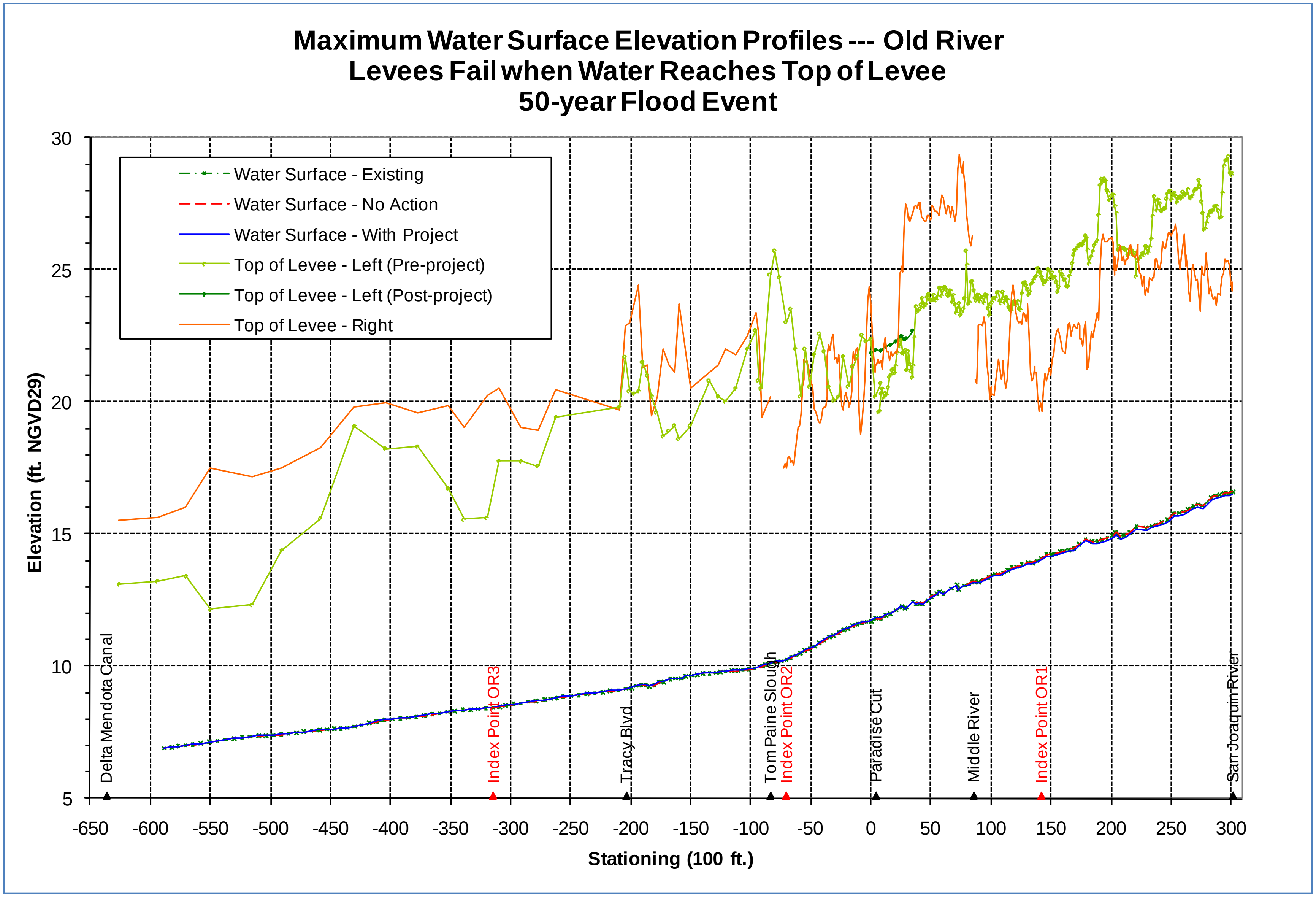
UPRR (SPRR)
Index Point PC2
I-5
Index Point PC1
UPRR
Paradise Weir

Figure C-8



Maximum Water Surface Elevation Profiles --- Old River
Levees Fail when Water Reaches Top of Levee
50-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left (Pre-project)
Top of Levee - Left (Post-project)
Top of Levee - Right
Elevation (ft. NGVD29)
Stationing (100 ft.)
Delta Mendota Canal
Index Point OR3
Tracy Blvd
Tom Paine Slough
Index Point OR2
Paradise Cut
Middle River
Index Point OR1
San Joaquin River
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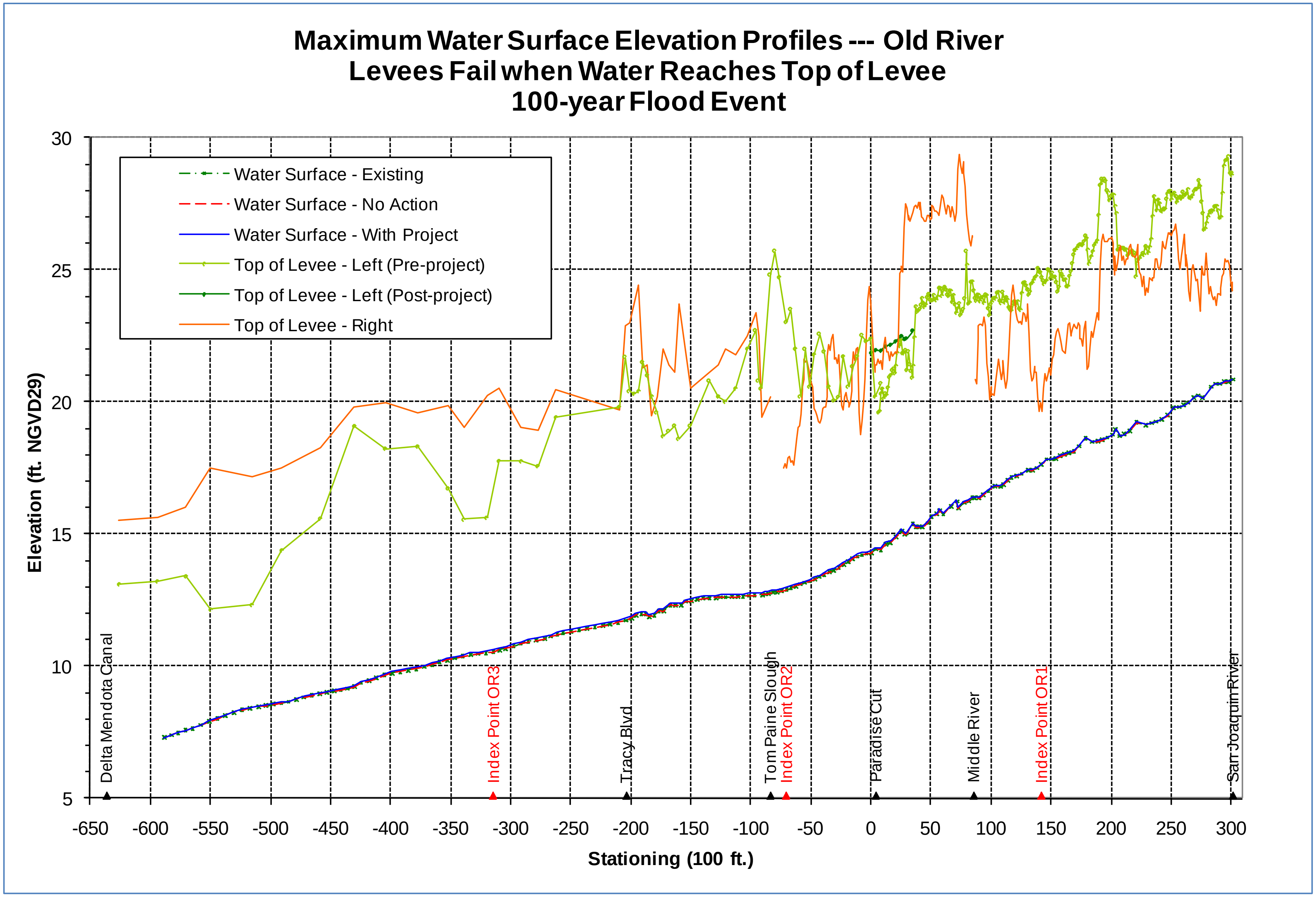
Figure C-9



Maximum Water Surface Elevation Profiles --- Old River
Levees Fail when Water Reaches Top of Levee
100-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left (Pre-project)
Top of Levee - Left (Post-project)
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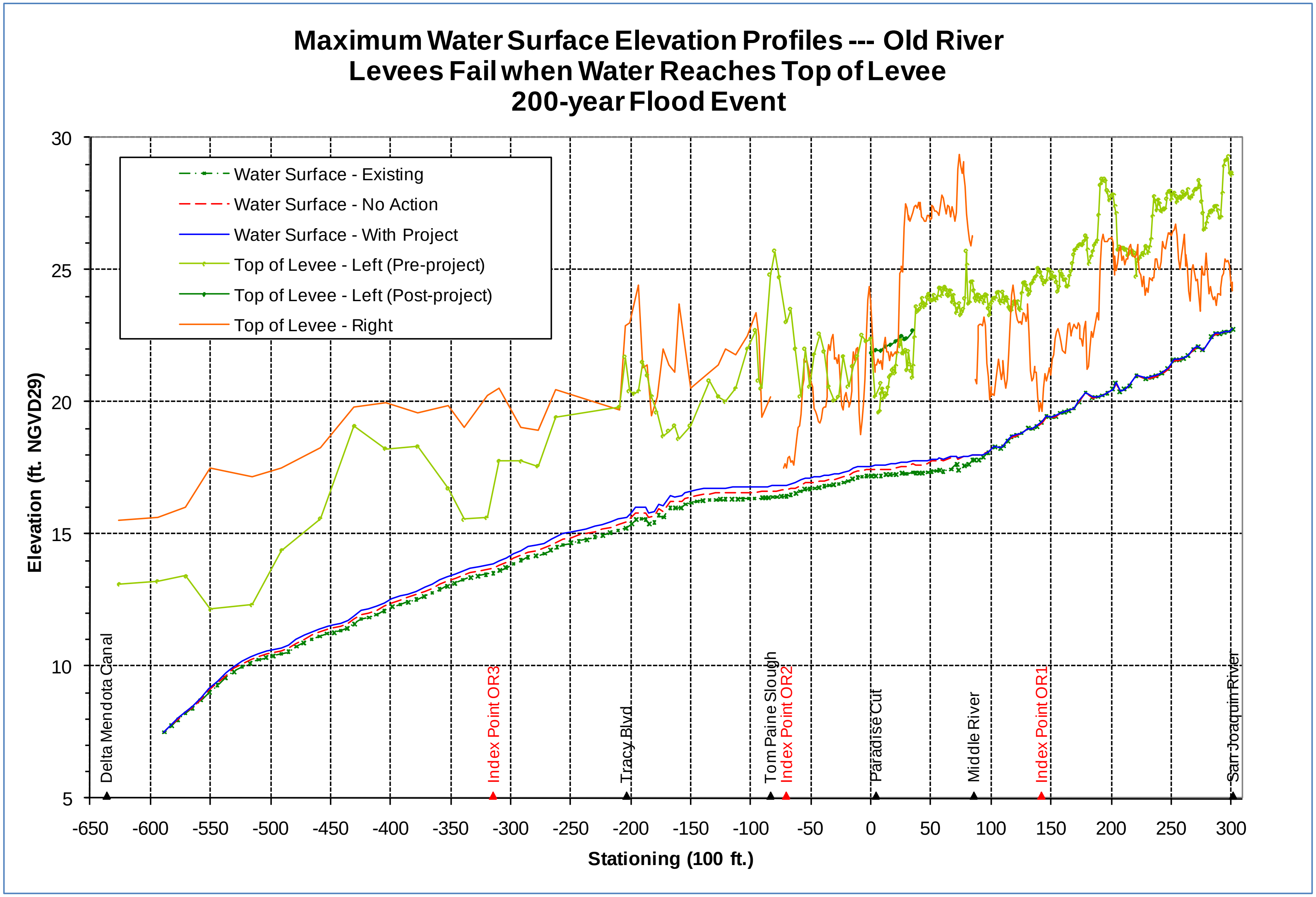
Figure C-10


Maximum Water Surface Elevation Profiles --- Old River
Levees Fail when Water Reaches Top of Levee
200-year Flood Event
Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
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Top of Levee - Left (Post-project)
Top of Levee - Right
Elevation (ft. NGVD29)
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Delta Mendota Canal
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Tracy Blvd
Tom Paine Slough
Index Point OR2
Paradise Cut
Middle River
Index Point OR1
San Joaquin River
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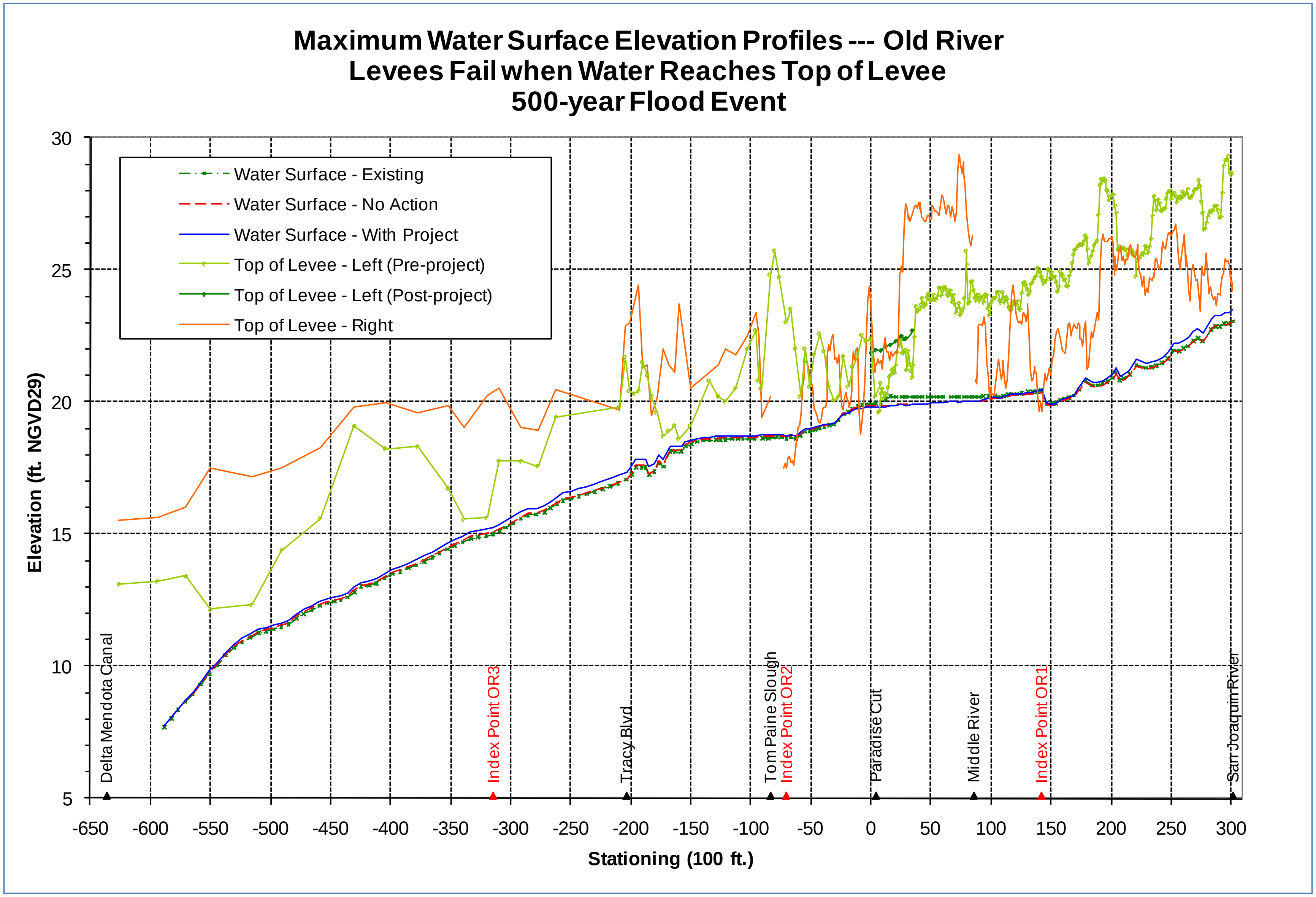
Stationing (100 ft.)

Figure C-11


Maximum Water Surface Elevation Profiles --- Old River
Levees Fail when Water Reaches Top of Levee
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Water Surface - Existing
Water Surface - No Action
Water Surface - With Project
Top of Levee - Left (Pre-project)
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Delta Mendota Canal
Index Point OR3
Tracy Blvd
Tom Paine Slough
Index Point OR2
Paradise Cut
Middle River
Index Point OR1
San Joaquin River

Figure C-12

Appendix E – TJKM Draft Traffic Impact Study for River Islands Phase 2B Development

TJKM
Transportation
Consultants

Vision That Moves Your Community

Revised Draft Report

Traffic Impact Study for River Islands Phase 2B Development

In the City of Lathrop

June 10, 2010

Pleasanton

Fresno

Sacramento

Santa Rosa

TJKM

www.tjkm.com

TJKM
Transportation
Consultants

Vision That Moves Your Community

Revised Draft Report

Traffic Impact Study for River Islands Phase 2B Development

In the City of Lathrop

June 10, 2010

TJKM
www.tjkm.com

Prepared by:
TJKM Transportation Consultants
3875 Hopyard Road
Suite 200
Pleasanton, CA 94588-8526
Tel: 925.463.0611
Fax: 925.463.3690

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Introduction and Summary

Introduction

This report presents the results of TJKM's traffic impact analysis of Phase 2B of the proposed River Islands Development in the City of Lathrop. The purpose of this traffic study is to evaluate the potential traffic impacts of this development phase, determine potential mitigation measures, and to identify any critical traffic issues that should be addressed in the draft River Islands Development Environmental Impact Statement (EIS). This analysis builds upon past traffic analysis completed for the River Islands Supplemental Environmental Impact Report (SEIR), as well as subsequent related TJKM studies for the River Islands Development and the Lathrop Traffic Monitoring Program (TMP). Figure 1 illustrates the location of the proposed River Islands Development and its vicinity. Figure 2 shows the proposed River Islands Development site plan.

In addition to analysis of existing traffic conditions, two future analysis years are also studied – 2017 and 2031. In these two future years, for the purposes of the EIS analysis, a baseline condition is analyzed that includes full build of Phases 1 and 2A of the River Islands Development. Under 2017 and 2031 conditions with the proposed project (termed With Action for EIS purposes), approximately seven percent and 100 percent of River Islands Phase 2B are assumed to be built, respectively.

This report includes analysis of five study scenarios, 13 study intersections external to the River Islands Development, 18 intersections internal to the development, four roadway segments, nine freeway mainline segments, 16 freeway ramp merge/diverge locations, and two freeway weaving sections. For the purposes of the EIS, significant impacts from River Islands Phase 2B are identified based on established traffic operational thresholds for Lathrop, Tracy, San Joaquin County, and Caltrans facilities. Mitigations are then identified and evaluated for the potential to mitigate impacts to less than significant levels and to determine whether they are currently programmed or funded.

Summary

River Islands Development Assumptions (Baseline / With Action)

Under the Baseline scenarios for 2017 and 2031, Phases 1 and 2a of the River Islands Development are assumed to be completed, in addition to assumed buildout development in the surrounding areas of West Lathrop, Mossdale Village, and Central Lathrop. The two River Islands phases are expected to consist of approximately 4,284 single- and multi-family residential units, approximately three million square feet of commercial uses (retail, service, office, and related uses), and supporting services including schools and a fire station.

Under Year 2017 With Action Conditions, approximately seven percent of Phase 2B of the River Islands Development is additionally assumed to be built for purposes of this EIS traffic analysis. Partial Phase 2B completion assumes that 470 residential units would be built (271 single-family and 199 multi-family), along with approximately 140,000 square feet of commercial development.

Under Year 2031 With Action Conditions, it is assumed that Phase 2B of the River Islands Development is fully built. Full Phase 2B completion assumes that 6,720 residential units would be built (3,871 single-family and 2,849 multi-family), along with approximately 2,000,000 square feet of commercial development.

River Islands Development trip rates by land use type and trip purpose, as well as vehicle miles traveled that were estimated from the travel demand model runs for all future year scenarios are included in Appendix F.

A summary of study transportation facilities with deficient levels of service (LOS) follows for each study analysis scenario. This summary also identifies the effects of the partial / full build River Islands Phase 2B (With Action) Development in terms of significant impacts, recommends mitigation measures, and determines whether the recommended mitigation measures address the identified significant impacts.

Existing Conditions

Intersections – Currently, all study intersections operate at acceptable levels of service during both weekday a.m. and p.m. peak hours.

Roadway Segments – Currently, all study roadway segments operate at acceptable levels of service during both weekday a.m. and p.m. peak hours.

Freeway Mainline Segments – Currently, all study freeway mainline segments operate at acceptable levels of service during both weekday a.m. and p.m. peak hours.

Freeway Weaving Sections – Currently, both study freeway weaving sections operate at acceptable levels of service during both weekday a.m. and p.m. peak hours, with the exception of the northbound Interstate 5 (I-5) weave between the Mossdale Road on-ramp and State Route (SR) 120 off-ramp (LOS E during the p.m. peak hour).

Freeway Ramp Merge / Diverge Locations – Currently, all study freeway ramp merge / diverge locations operate at acceptable levels of service during both weekday a.m. and p.m. peak hours.

Year 2017 Baseline Conditions

The following intersections are expected to operate unacceptably under this scenario:

- Golden Valley Parkway / River Islands Parkway (LOS F during the p.m. peak hour)
- I-5 Southbound Ramps / Louise Avenue (LOS E during both peak hours)
- I-5 Northbound Ramps / Louise Avenue (LOS E during the p.m. peak hour)
- Harlan Road / Louise Avenue (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour)
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour)
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours)
- Paradise Road / Arbor Avenue (LOS F during both peak hours)
- Paradise Road / I-205 Westbound Ramps (LOS F during the p.m. peak hour)

Year 2017 With Action Conditions

The partial build of Phase 2B of the River Islands Development is expected to cause a significant impact at the following intersections, with results of recommended mitigations also listed below:

- Golden Valley Parkway / River Islands Parkway (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 Southbound Ramps / Louise Avenue (LOS F during the a.m. peak hour and LOS E during the p.m. peak hour). Mitigation result: Significant and unavoidable.

- I-5 Northbound Ramps / Louise Avenue (LOS F during the p.m. peak hour). Mitigation result: Significant and unavoidable.
- Harlan Road / Louise Avenue (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour). Mitigation result: Less than significant.
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour). Mitigation result: Less than significant.
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours). Mitigation result: Less than significant.
- Paradise Road / Arbor Avenue (LOS F during both peak hours). Mitigation result: Significant and unavoidable.
- Paradise Road / I-205 Westbound Ramps (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour). Mitigation result: Less than significant.

Year 2031 Baseline Conditions

Intersections – the following study intersections are expected to operate unacceptably under this scenario:

- Golden Valley Parkway / River Islands Parkway (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour)
- I-5 Southbound Ramps / Louise Avenue (LOS F during both peak hours)
- I-5 Northbound Ramps / Louise Avenue (LOS F during the p.m. peak hour)
- Harlan Road / Louise Avenue (LOS F during both peak hours)
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour)
- McKee Boulevard / River Islands Parkway (LOS E during the p.m. peak hour)
- MacArthur Drive / I-205 Eastbound Ramps (LOS F during the p.m. peak hour)
- MacArthur Drive / I-205 Westbound Ramps (LOS F during both peak hours)
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours)
- Paradise Road / Arbor Avenue (LOS F during both peak hours)
- Paradise Road / I-205 Westbound Ramps (LOS F during both peak hours)

Roadway Segments – Under 2031 Baseline Conditions, all study roadway segments are expected to operate at acceptable levels of service during both weekday a.m. and p.m. peak hours.

Freeway Mainline Segments – Under 2031 Baseline Conditions, the following freeway mainline segments are expected to operate unacceptably:

- I-5 north of Louise Avenue Interchange (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-5 between Louise Avenue and SR 120 (LOS E for the southbound a.m. peak hour)
- I-5 between SR 120 and Manthey/Mossdale Interchange (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-5 between Manthey/Mossdale Interchange and I-205 (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-205 between I-5 and Paradise Avenue Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)

- I-205 between Paradise Avenue and MacArthur Drive Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- I-205 west of MacArthur Drive (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- SR 120 east of I-5 (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)

Freeway Ramp Merge / Diverge Locations – Under 2031 Baseline Conditions, the following diverge and merge locations are expected to operate unacceptably:

- I-5 / Louise Avenue Northbound Off-Ramp (LOS F during p.m. peak hour)
- I-5 / Louise Avenue Northbound On-Ramp (LOS F during p.m. peak hour)
- I-5 / Louise Avenue Southbound Off-Ramp (LOS F during a.m. peak hour)
- I-5 / Louise Avenue Southbound On-Ramp (LOS F during both peak hours)
- I-5 / Manthey Road Southbound Off-Ramp (LOS F during a.m. peak hour)
- I-5 / Manthey Road Southbound On-Ramp (LOS F during a.m. peak hour)
- I-5 / Mossdale Road Northbound Off-Ramp (LOS F during p.m. peak hour)
- I-5 / Mossdale Road Northbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Eastbound Off-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Eastbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Westbound Off-Ramp (LOS F during a.m. peak hour)
- I-205 / MacArthur Drive Westbound On-Ramp (LOS F during a.m. peak hour)
- I-205 / Paradise Road Eastbound Off-Ramp (LOS F during p.m. peak hour)
- I-205 / Paradise Road Eastbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / Paradise Road Westbound Off-Ramp (LOS F during a.m. peak hour)
- I-205 / Paradise Road Westbound On-Ramp (LOS F during a.m. peak hour)

Year 2031 With Action Conditions

Intersections – The full build of Phase 2B of the River Islands Development is expected to cause a significant impact at the following intersections, with results of recommended mitigations also listed below:

- Golden Valley Parkway / River Islands Parkway (LOS F during both peak hours). Mitigation result: Significant and unavoidable.
- I-5 Southbound Ramps / Louise Avenue (LOS F during both peak hours). Mitigation result: Significant and unavoidable.
- I-5 Northbound Ramps / Louise Avenue (LOS F during the p.m. peak hour). Mitigation result: Significant and unavoidable.
- Harlan Road / Louise Avenue (LOS F during both peak hours). Mitigation result: Less than significant.
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour). Mitigation result: Less than significant.
- McKee Boulevard / River Islands Parkway (LOS E during the p.m. peak hour). Mitigation result: Less than significant.

- MacArthur Drive / I-205 Eastbound Ramps (LOS F during the p.m. peak hour). Mitigation result: Less than significant.
- MacArthur Drive / I-205 Westbound Ramps (LOS E during the p.m. peak hour). Mitigation result: Less than significant.
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours). Mitigation result: Less than significant.
- Paradise Road / Arbor Avenue (LOS F during both peak hours). Mitigation result: Significant and unavoidable.
- Paradise Road / I-205 Westbound Ramps (LOS F during both peak hours). Mitigation result: Less than significant.

<u>Roadway Segments</u> – The full build of Phase 2B of the River Islands Development is expected to cause a significant impact at one roadway segment of Paradise Road between Arbor Avenue and I-205 (LOS D for the northbound direction during the p.m. peak hour and southbound direction during the a.m. peak hour). With a mitigation of widening to six lanes, traffic operations would improve to acceptable standards. However, since this mitigation is not programmed or funded, this impact would remain significant and unavoidable.

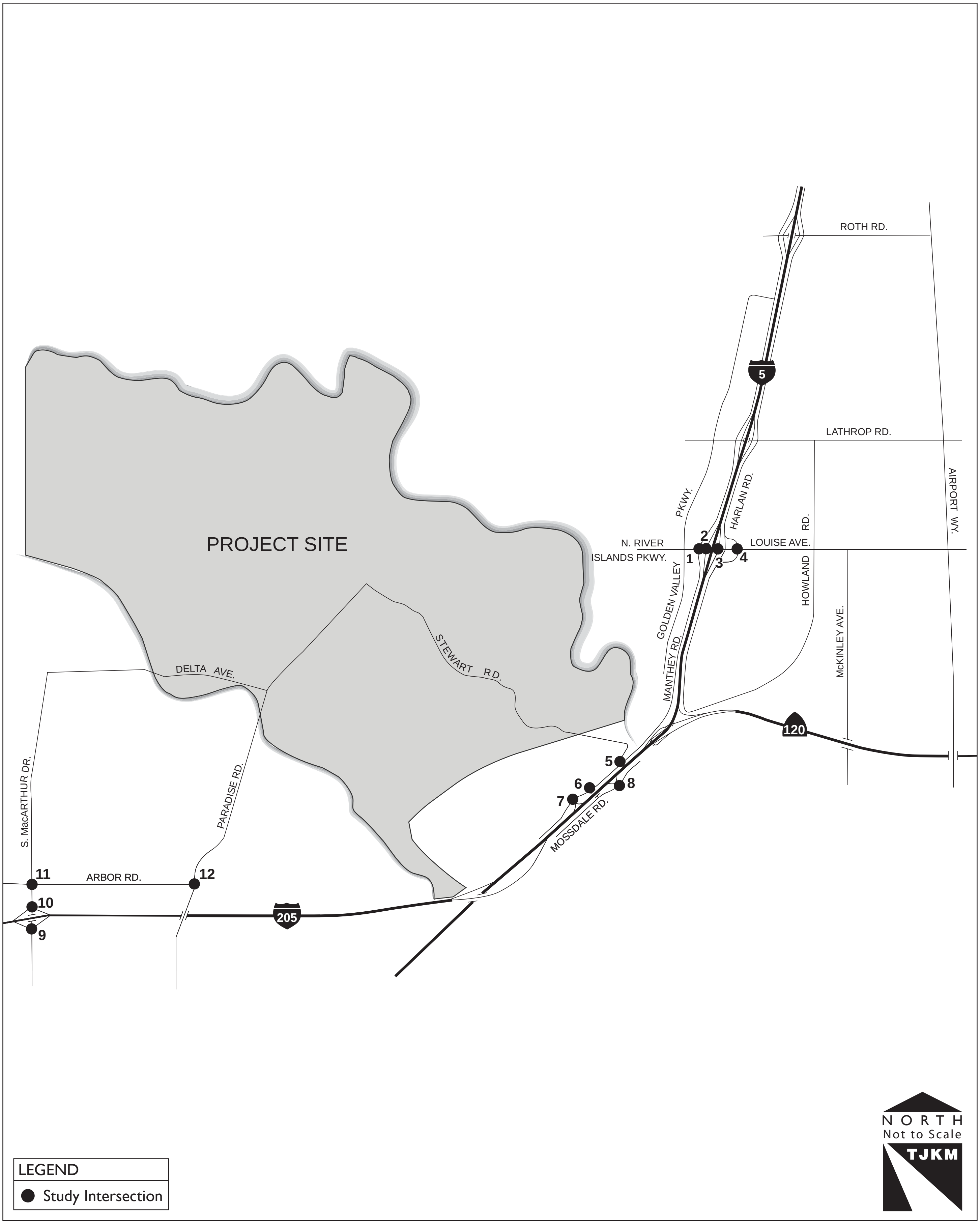
<u>Freeway Mainline Segments</u> – The full build of Phase 2B of the River Islands Development is expected to cause a significant impact at the following freeway mainline segments, with results of recommended mitigations also listed below:

- I-5 north of Louise Avenue Interchange (LOS F for the northbound p.m. peak hour and LOS E for the southbound a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 between SR 120 and Manthey/Mossdale Interchange (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 between Manthey/Mossdale Interchange and I-205 (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 south of I-205 (LOS E for the northbound p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 between I-5 and Paradise Avenue Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 between Paradise Avenue and MacArthur Drive Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 west of MacArthur Drive (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour). Mitigation result: Significant and unavoidable.
- SR 120 east of I-5 (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour). Mitigation result: Significant and unavoidable.

Freeway Ramp Merge / Diverge Locations – The full build of Phase 2B of the River Islands Development is expected to cause a significant impact at the following freeway ramp merge / diverge locations, with results of recommended mitigations also listed below:

- I-5 / Louise Avenue Northbound Off-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 / Louise Avenue Northbound On-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 / Louise Avenue Southbound Off-Ramp (LOS F during both peak hours). Mitigation result: Significant and unavoidable.
- I-5 / Louise Avenue Southbound On-Ramp (LOS F during both peak hours). Mitigation result: Significant and unavoidable.
- I-5 / Manthey Road Southbound Off-Ramp (LOS F during a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 / Manthey Road Southbound On-Ramp (LOS F during a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 / Mossdale Road Northbound Off-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-5 / Mossdale Road Northbound On-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / MacArthur Drive Eastbound Off-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / MacArthur Drive Eastbound On-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / MacArthur Drive Westbound Off-Ramp (LOS F during a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / MacArthur Drive Westbound On-Ramp (LOS F during a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / Paradise Road Eastbound Off-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / Paradise Road Eastbound On-Ramp (LOS F during p.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / Paradise Road Westbound Off-Ramp (LOS F during a.m. peak hour). Mitigation result: Significant and unavoidable.
- I-205 / Paradise Road Westbound On-Ramp (LOS F during a.m. peak hour). Mitigation result: Significant and unavoidable.

Vicinity Map



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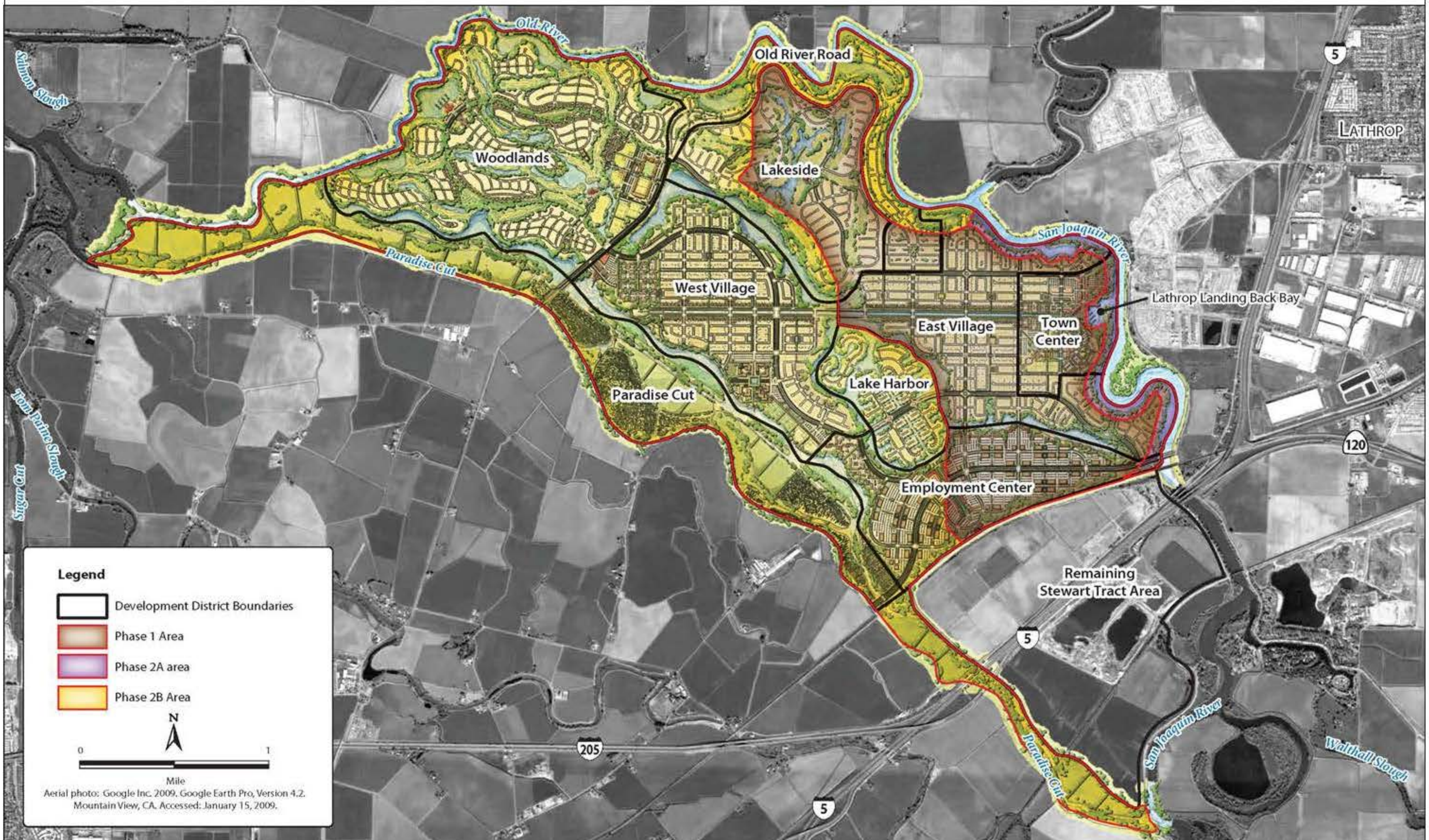
Proposed Site Plan

Figure 2



Level of Service Analysis Methodology

Level of service is a qualitative measure that describes operational conditions as they relate to the traffic stream and perceptions by motorists and passengers. The level of service generally describes these conditions in terms of such factors as speed and travel time, delays, freedom to maneuver, traffic interruptions, comfort, convenience and safety. The operational levels of service (LOS) are given letter designations from "A" to "F," with "A" representing the best operating conditions (free-flow) and "F" the worst (severely congested flow with high delays). Intersections generally are the capacity-controlling locations with respect to traffic operations on arterial and collector streets.

Signalized Intersections

The study intersections under traffic signal control were analyzed using the Highway Capacity Manual 2000 (HCM 2000) Operations Method contained in the standard traffic software Synchro. This methodology determines LOS based on average control delay per vehicle for the overall intersection during peak hour intersection operating conditions. LOS "A" indicates free flow conditions with little or no delay, while LOS "F" indicates jammed conditions with excessive delay and long back-ups. The methodology is described in detail in Appendix A.

Unsignalized Intersections

The operating conditions at the study intersections with minor stop-controlled approaches (one-way or two-way) were evaluated using the HCM 2000 Unsignalized Methodology, also contained in Synchro. For two-way stop controlled intersections, LOS is based on and reported for the worse of the two minor approaches. For all-way stop controlled intersections, LOS is based on the average control delay experienced on all approaches. The methods rank level of service on an "A" through "F" scale (similar to that used for signalized intersections) to describe travel delay and congestion. The methodologies for unsignalized intersections are also presented in Appendix A.

Roadway Segments

For all study roadway segments under Existing Conditions, TJKM utilized the HCM 2000 LOS methodology for two-way, two-lane highways (HCM Chapter 20). This methodology uses vehicles' percent time spent following (PTSF) and volume-to-capacity (v/c) ratios to determine LOS on a two-lane rural roadway facility.

Table I shows the relationship between PTSF and LOS.

Table I: Level of Service Criteria – Two-Lane Highways

Level of Service	*Percent Time Spent Following*
A	40
B	55
C	70
D	85
E	>85
F	Varies

Source: Transportation Research Board, 2000 Highway Capacity Manual, Exhibit 20-4.
Note: Percent time spent following values based on assumed Class II roadway classification.

For study roadway segments that are expected to expand from two to four lanes under Year 2031 conditions with and without the proposed project, TJKM utilized the HCM 2000 LOS methodology for multilane highways (HCM Chapter 21). This methodology relates vehicle density per lane to LOS, as shown in Table II.

Table II: Level of Service Criteria – Multilane Highways

Level of Service	*Maximum Density (pvpmpl)*
A	11
B	18
C	26
D	35
E	45
F	Varies

Source: Transportation Research Board, 2000 Highway Capacity Manual, Exhibit 21-2.
Notes: pvpmpl = passenger vehicles per mile per lane; density values based on assumed 45 mph free flow speed.

Freeway Mainline Segment Analysis
TJKM utilized Chapter 23 of the HCM 2000 for analysis of basic freeway mainline segments. The HCM 2000 methodology for this type of facility relates volume-to-capacity (v/c) ratios and vehicle density (vehicles per mile per lane) to LOS. Table III shows the LOS criteria for freeway mainline segments.

Table III: Level of Service Criteria – Freeway Mainline Segment

Level of Service	*Maximum Density (pvpmpl)*
A	11
B	18
C	26
D	35
E	45
F	Varies

Source: Transportation Research Board, 2000 Highway Capacity Manual, page 23-3.
Notes: pvpmpl = passenger vehicles per mile per lane

Freeway Weaving Section Analysis
TJKM utilized Chapter 24 of the HCM 2000 for analysis of freeway weaving sections. The HCM 2000 methodology for this type of facility relates volume-to-capacity (v/c) ratios and vehicle density (vehicles per mile per lane) to LOS. TJKM used collected existing counts on the study freeway mainlines and ramps to estimate proportions of all possible weaving maneuvers. Table IV shows the LOS criteria for freeway weaving sections.

Table IV: Level of Service Criteria – Freeway Weaving Section

Level of Service	*Maximum Density (pvpmpl)*
A	10
B	20
C	28
D	35
E	43
F	Varies

Source: Transportation Research Board, 2000 Highway Capacity Manual, Exhibit 24-2.
Notes: pvpmpl = passenger vehicles per mile per lane

Freeway Ramp Merge/Diverge Analysis

TJKM utilized Chapter 25 of the HCM 2000 for analysis of freeway ramp merge and diverge locations. The HCM 2000 methodology for these types of facilities relates volume-to-capacity (v/c) ratios and vehicle density (vehicles per mile per lane) to LOS. Table V shows the LOS criteria for freeway merge / diverge locations.

Table V: Level of Service Criteria – Freeway Merge / Diverge Locations

Level of Service	*Maximum Density (pvpmpl)*
A	10
B	20
C	28
D	35
E	>35
F	Demand exceeds capacity

Source: Transportation Research Board, 2000 Highway Capacity Manual, Exhibit 25-4.
Notes: pvpmpl = passenger vehicles per mile per lane

Facility Traffic Operational Standards

Intersections

The City of Lathrop considers LOS "D" to be the limit of acceptable operations for the signalized intersections under its jurisdiction. The City does not have a published standard for all-way stop controlled or minor side street stop controlled intersections. According to City staff, all-way stop operational standards are equated with signalized intersections standards (i.e. LOS D), while LOS E is considered to be the minimum acceptable service level for minor side street stop controlled intersections. In the City of Tracy, LOS D is the minimum operational standard for signalized and all-way stop controlled intersections located along the I-205 corridor. Finally, in San Joaquin County, LOS C is the minimum acceptable operations level for signalized, all-way stop controlled, and minor street stop controlled intersections.

Roadway Segments

Consistent with prior analysis for the River Islands Draft Environmental Impact Report (DEIR), rural roadway locations in San Joaquin County and the City of Tracy are analyzed in this traffic study. According to San Joaquin County staff, LOS C is the minimum acceptable operations level for rural two-lane roadways, specifically Paradise Road and Arbor Avenue within the study area. In the City of Tracy, LOS D is the minimum acceptable operations level for rural two-lane roadways near Interstate 205, specifically MacArthur Drive within the study area.

Freeway Facilities (Mainline, Weaving, and Ramp Merge/Diverge)

According to the California Department of Transportation (Caltrans) District 10, LOS D is used as the minimum acceptable operations standard for freeway mainline segments, freeway weaving segments, and freeway ramp merge/diverge locations in the Lathrop / Tracy area.

Significant Impact Criteria

The River Islands SEIR previously established significance criteria for the proposed River Islands Development, which were primarily based on standards established by City of Lathrop Public Works, the City of Lathrop General Plan, Caltrans standards, San Joaquin County standards, and

City of Tracy standards. Phase 2B of the River Islands Development would cause a significant traffic impact if it would result in one or more of the following thresholds being exceeded:

- If project traffic degrades baseline operations at a signalized or all-way stop controlled intersection in the City of Lathrop or Tracy from LOS A through D to LOS E or F, or degrades baseline operation at a City of Lathrop side street stop-controlled location from LOS A through E to LOS F
- If the project increases baseline traffic by one percent or more at a signalized or all-way stop controlled intersection in the City of Lathrop or City of Tracy already operating at LOS E or F
- If project traffic degrades baseline operations along a roadway or at a signalized, all-way stop controlled, or side street stop controlled intersection in San Joaquin County from LOS A through C to LOS D, E, or F
- If project increases baseline traffic by one percent or more along a roadway or at a signalized, all-way stop controlled, or side street stop controlled intersection in San Joaquin County already operating at LOS D, E, or F
- If project traffic degrades baseline operations at a freeway mainline segment, freeway ramp merge/diverge location, or freeway weaving section from LOS A through D to LOS E or F, or degrades baseline operation at a City of Lathrop side street stop-controlled location from LOS A through E to LOS F
- If the project increases baseline traffic by one percent or more at a freeway mainline segment, freeway ramp merge/diverge location, or freeway weaving section already operating at LOS E or F

Study Traffic Analysis Scenarios
The study evaluated traffic operational conditions under the following five (5) analysis scenarios:

1. *Existing Conditions* – Current (2009) traffic volumes, roadway, and local land use conditions.
2. *Year 2017 Baseline Conditions* – This scenario analyzes model-generated traffic volumes that are based on expected background development growth by 2017 in West Lathrop, Mossdale Village, Central Lathrop, and greater San Joaquin County, as well as expected roadway improvements. For purposes of the EIS traffic analysis, this baseline also assumes full build of the proposed River Islands Development's Phases 1 and 2A, but no build of Phase 2B.
3. *Year 2017 With Action Conditions* – This scenario is identical to Year 2017 Baseline Conditions, but with the addition of approximately seven percent of Phase 2B of the proposed River Islands Development.
4. *Year 2031 Baseline Conditions* – This scenario analyzes model-generated traffic volumes that are based on expected background development growth by 2031 in West Lathrop, Mossdale Village, Central Lathrop, and greater San Joaquin County, as well as expected roadway improvements. For purposes of the EIS traffic analysis, this baseline also assumes full build of the proposed River Islands Development's Phases 1 and 2A, but no build of Phase 2B.
5. *Year 2031 With Action) Conditions* – This scenario is identical to Year 2031 Baseline Conditions, but with the addition of the full build Phase 2B of the proposed River Islands Development.

Study Facilities
The study focused on evaluating existing and future year traffic operational conditions at intersections, roadway segments, and freeway facilities that potentially may be impacted by the proposed River Islands Phase 2B development project. The facilities selected are consistent with those selected for analysis in the River Islands SEIR as well as subsequent TJKM traffic studies of intersections that will be internal to the River Islands development site. The study facilities are identified below.

Intersections

Existing traffic operations were evaluated at the following 12 existing study intersections consistent with the River Islands SEIR analysis (see Figure 1):

1. Manthey Road/Louise Avenue
2. I-5 Southbound Ramps/Louise Avenue
3. I-5 Northbound Ramps/Louise Avenue
4. Harlan Road/Louise Avenue
5. Manthey Road/Stewart Road
6. Manthey Road/I-5 Underpass
7. Manthey Road/I-5 Southbound Ramps
8. Mossdale Rd/I-5 Northbound Ramps
9. MacArthur Drive/I-205 Eastbound Ramps
10. MacArthur Drive/I-205 Westbound Ramps
11. MacArthur Drive/Arbor Avenue
12. Paradise Road/Arbor Avenue

Under Year 2017 and 2031 development and traffic conditions, the following existing and future study intersections were analyzed:

<u>Intersections External to River Islands Project Site</u>

1. Golden Valley Parkway/River Islands Parkway
2. I-5 Southbound Ramps/Louise Avenue
3. I-5 Northbound Ramps/Louise Avenue
4. Harlan Road/Louise Avenue
5. Golden Valley Parkway/Towne Centre Drive
6. Golden Valley Parkway/Brookhurst Boulevard
7. McKee Boulevard/River Islands Parkway
8. Silvera Access/River Islands Parkway
9. MacArthur Drive/I-205 Eastbound Ramps
10. MacArthur Drive/I-205 Westbound Ramps
11. Paradise Road/I-205 Eastbound Ramps
12. Paradise Road/Arbor Avenue
13. Paradise Road/I-205 Westbound Ramps

Intersections Internal to River Islands Project Site

1. Paradise Road/S. Woodlands Drive
2. Paradise Road/N. Woodlands Drive
3. Lakeside Drive/N. River Islands Parkway (W)
4. Lakeside Drive/N. River Islands Parkway (E)
5. Old River Road/N. River Islands Parkway
6. D-27 Street/N. River Islands Parkway
7. Broad Street/N. River Islands Parkway
8. Commercial Street/N. River Islands Parkway
9. Water Street/N. River Islands Parkway
10. Broad Street/Canal Street
11. Lake Harbor Boulevard/S. River Islands Parkway
12. D-27 Street/S. River Islands Parkway
13. Broad Street/S. River Islands Parkway
14. Commercial Street/S. River Islands Parkway
15. Golden Valley Parkway/Lake Harbor Boulevard
16. D-27 Street/Golden Valley Parkway
17. Broad Street/Golden Valley Parkway
18. S. River Islands Parkway/Golden Valley Parkway

Roadway Segments

Traffic operations were evaluated for existing and future year conditions at the following roadway segment locations within the study area:

1. Paradise Road between Arbor Avenue and Paradise Cut
2. Paradise Road between Arbor Avenue and Interstate 205
3. Arbor Avenue between Paradise Road and MacArthur Drive
4. MacArthur Drive between Arbor Avenue and Interstate 205

Freeway Mainline Segments

Traffic operations were evaluated for existing and future year conditions at the following freeway mainline segments within the study area:

1. I-5 North of Louise Avenue Interchange
2. I-5 between Louise Avenue and SR 120 Interchanges
3. I-5 between SR 120 and Manthey Road / Mossdale Road Interchanges
4. I-5 between Manthey Road / Mossdale Road and I-205 Interchanges
5. I-5 South of I-205 Interchange
6. I-205 between I-5 and MacArthur Drive Interchanges
   (2017/2031: two segments between I-5/Paradise (new interchange) and Paradise/ MacArthur)
7. I-205 West of MacArthur Drive Interchange
8. SR 120 East of I-5 Interchange

Freeway Weaving Segments

Traffic operations for local freeway weaving segments were evaluated for existing conditions only, consistent with the River Islands SEIR. For the DEIR, Caltrans requested weaving analysis for existing conditions, since at the time it was expected that some traffic from initial River Islands development would use the I-5 / Manthey Road / Mossdale Road hook ramps until the primary gateways (River Islands Parkway, Golden Valley Parkway, etc.) were constructed in future years (Year 2017 onward). This interim access condition was expected to effectively create a weaving condition with upstream and downstream I-205 and SR 120 access ramps at I-5. Therefore, for this study, only existing conditions are analyzed for the following freeway weaving segments:

<u>I-5 Northbound</u>

1. I-5 Northbound between I-205 On-Ramp Merge and Mossdale Road Off-Ramp Diverge
2. I-5 Northbound between Mossdale Road On-Ramp Merge and SR 120 Off-Ramp Diverge

<u>I-5 Southbound</u>

1. I-5 Southbound between SR 120 On-Ramp Merge and Manthey Road Off-Ramp Diverge
2. I-5 Southbound between Manthey Road On-Ramp Merge and I-205 Off-Ramp Diverge

Freeway Ramp Merge / Diverge Locations

Traffic operations were evaluated for existing and future year conditions at the following freeway ramp merge and diverge locations within the study area:

1. I-5 / Louise Avenue Interchange – Northbound and Southbound On-Ramps and Off-Ramps
2. I-5 / Manthey Road Interchange – Southbound On-Ramp and Off-Ramp
3. I-5 / Mossdale Road Interchange – Northbound On-Ramp and Off-Ramp
4. I-205 / MacArthur Drive Interchange – Eastbound and Westbound On-Ramps and Off-Ramps
5. I-205 / Paradise Road Interchange – Eastbound and Westbound On-Ramps and Off-Ramps (Years 2017 and 2031 only)

Baseline Conditions (Traffic Study) vs. No Action Conditions (EIS)

Since TJKM issued the draft traffic impact study report for the River Islands Development in February 2010, the EIS definition of No Action and With Action Conditions has changed. Under this new definition, the proposed development totals for River Islands Development Phases 1, 2A, and 2B under No Action Conditions are now identical to With Action Conditions. The main distinction between No Action Conditions and With Action Conditions is that only With Action Conditions include the approval of Federal permits as detailed in the latest EIS project description.

Based on this update to the project description, Baseline Conditions as defined in this traffic study are now considered Existing Conditions plus non-Proposed Action growth for years 2017 and 2031 in and around the project vicinity. In terms of proposed River Islands Development totals, Baseline Conditions are distinct from the No Action condition defined in the latest EIS project description in that Baseline Conditions only include full build Phases 1 and 2A. Traffic analysis results for years 2017 and 2031 in this study are based on the differential in trips between Baseline Conditions and With Action Conditions, in which With Action Conditions include completion of some or all of the proposed Phase 2B development as described previously.

Existing Conditions

Existing Roadway System and Setting

Interstate 5 (I-5) is a major north-south freeway serving the City of Lathrop. North of the City, I-5 continues to Stockton, Sacramento, Oregon and Washington. South of Lathrop, the freeway continues through the San Joaquin Valley on to Los Angeles, San Diego, and Mexico. Locally, I-5 distributes regional traffic to/from the San Francisco Bay Area via I-205 and to/from Lathrop and the Central Valley via SR 120.

In the project vicinity, the freeway runs along the east side of the River Islands development site. I-5 currently consists of three travel lanes per direction just south of I-205 and north of SR 120 and four to five travel lanes per direction (9-10 total, including auxiliary) between I-205 and SR 120. The main interchanges serving the project vicinity are Mossdale Road / Manthey Road and Louise Avenue / River Islands Parkway. The Mossdale Road / Manthey Road interchange are a set of hook ramps with an undercrossing connecting the two local roadways. The Louise Avenue interchange is a tight-diamond interchange with both the northbound and southbound ramps controlled by signals at their local street intersections.

Interstate 205 (I-205) is a major east-west freeway that connects I-5 to I-580, which continues westward to the San Francisco Bay Area via the Altamont Pass. The interchange with I-5 consists in not fully directional, consisting only of connections from I-5 southbound to I-205 westbound and I-205 eastbound to I-5 northbound. I-205 was recently widened from two to three travel lanes per direction, providing new additional capacity for its entire length. Currently, the MacArthur Drive interchange is the only interchange serving the project vicinity, located southwest of the project site. This interchange consists of a tight diamond configuration, with the eastbound and westbound ramps served by traffic signals at their respective local street intersections.

State Route 120 (SR 120) is a major east-west freeway that begins at I-5 and locally serves the cities of Lathrop and Manteca. The freeway portion of SR 120 continues easterly and terminates at SR 99, another major north-south freeway serving Lathrop and also the Central Valley. SR 120 currently consists of two travel lanes per direction.

Louise Avenue is a two- to four-lane arterial that connects the West Lathrop and future River Islands areas to I-5 and points east within the City of Lathrop. Louise Avenue currently consists of two travel lanes west of I-5 and four lanes east of the I-5 southbound ramps. West of the new Golden Valley Parkway, the roadway becomes River Islands Parkway, which ultimately will be one of two primary access points to River Islands from the north via a San Joaquin River bridge crossing (with Golden Valley Parkway as the other).

Manthey Road is a north-south, two-lane local frontage roadway located immediately west of I-5. It connects Stockton to the north with West Lathrop to the south and terminates just south of its existing hook ramps with I-5 Southbound.

Mossdale Road is a north-south, two-lane local frontage roadway located immediately east of I-5. It provides local land use access in Lathrop between the San Joaquin River and Paradise Cut and connects to I-5 Northbound via existing hook ramps. It also connects to Manthey Road via a roadway undercrossing at I-5.

MacArthur Drive is a north-south, four-lane arterial roadway from the I-205 interchange southerly to the City of Tracy. North of the I-205 interchange, it is a two-lane rural roadway serving mostly agricultural uses and single-family homes. At the I-205 undercrossing, it has a three-lane cross-section that includes a left turn lane for both ramps of the I-205 tight diamond interchange.

Stewart Road is two-lane rural roadway that begins at Manthey Road and runs westerly into the Stewart Tract, site of the proposed River Islands development.

Paradise Road is two-lane, north-south rural roadway that begins at Grant Line Road east of Tracy and extends northerly into the western end of River Islands development site. Along the way, it crosses over I-205 via a two-lane bridge and then crosses over Paradise Cut into the project site.

Arbor Avenue is a two-lane, east-west rural roadway beginning at Paradise Road south of the project site. It extends westerly towards the City of Tracy and runs parallel to I-205, crossing MacArthur Drive at a four-way stop controlled along the way.

Existing Traffic Volumes

Quality Traffic Data collected existing intersection turning movement counts in September 2009 during weekday a.m. and p.m. peak periods (7:00-9:00 a.m. and 4:00-6:00 p.m., respectively) at the 12 existing study intersections and the following three freeway mainline locations:

1. I-5 between the Louise Avenue and SR 120 Interchanges
2. SR 120 between the I-5 and Guthmiller Road Interchanges
3. I-205 between the I-5 and MacArthur Drive Interchanges

Peak hour traffic count sheets for the above study intersections and freeway mainline locations are included in Appendix B.

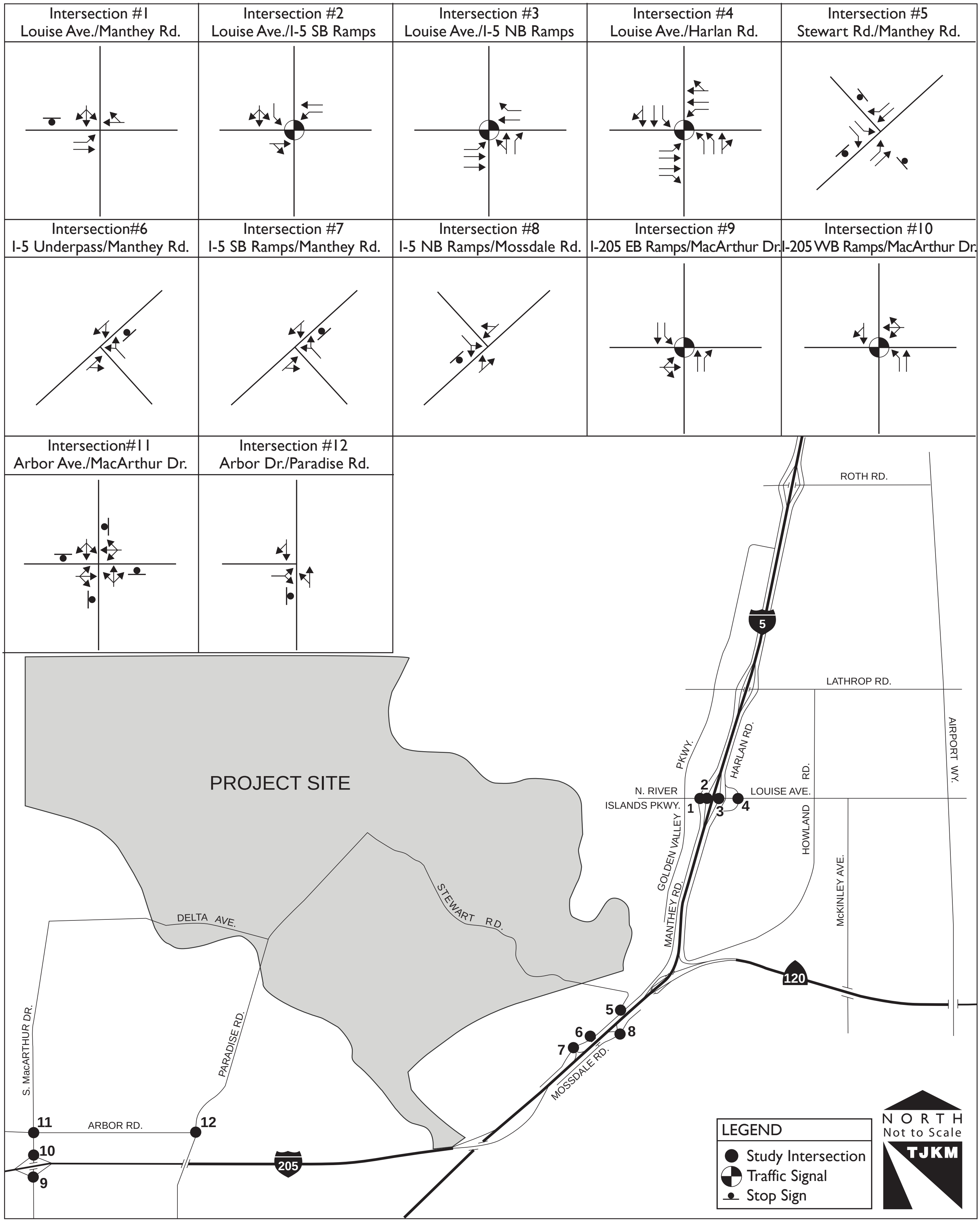
Intersection Level of Service Analysis Results (Existing Conditions)

Figure 3 shows the existing lane configurations and traffic controls at the study intersections analyzed under Existing Conditions. Figure 4 illustrates the existing peak hour turning movement volumes at the existing study intersections. Table VI summarizes the results of the intersection analysis under Existing Conditions. Detailed LOS calculations are contained in Appendix C. Currently, all study intersections operate at acceptable levels of service during both weekday a.m. and p.m. peak hours.

City of Lathrop - River Islands Phase 2 EIS

Existing Lane Geometry

Figure 3



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Existing Turning Movement Volumes

Figure 4

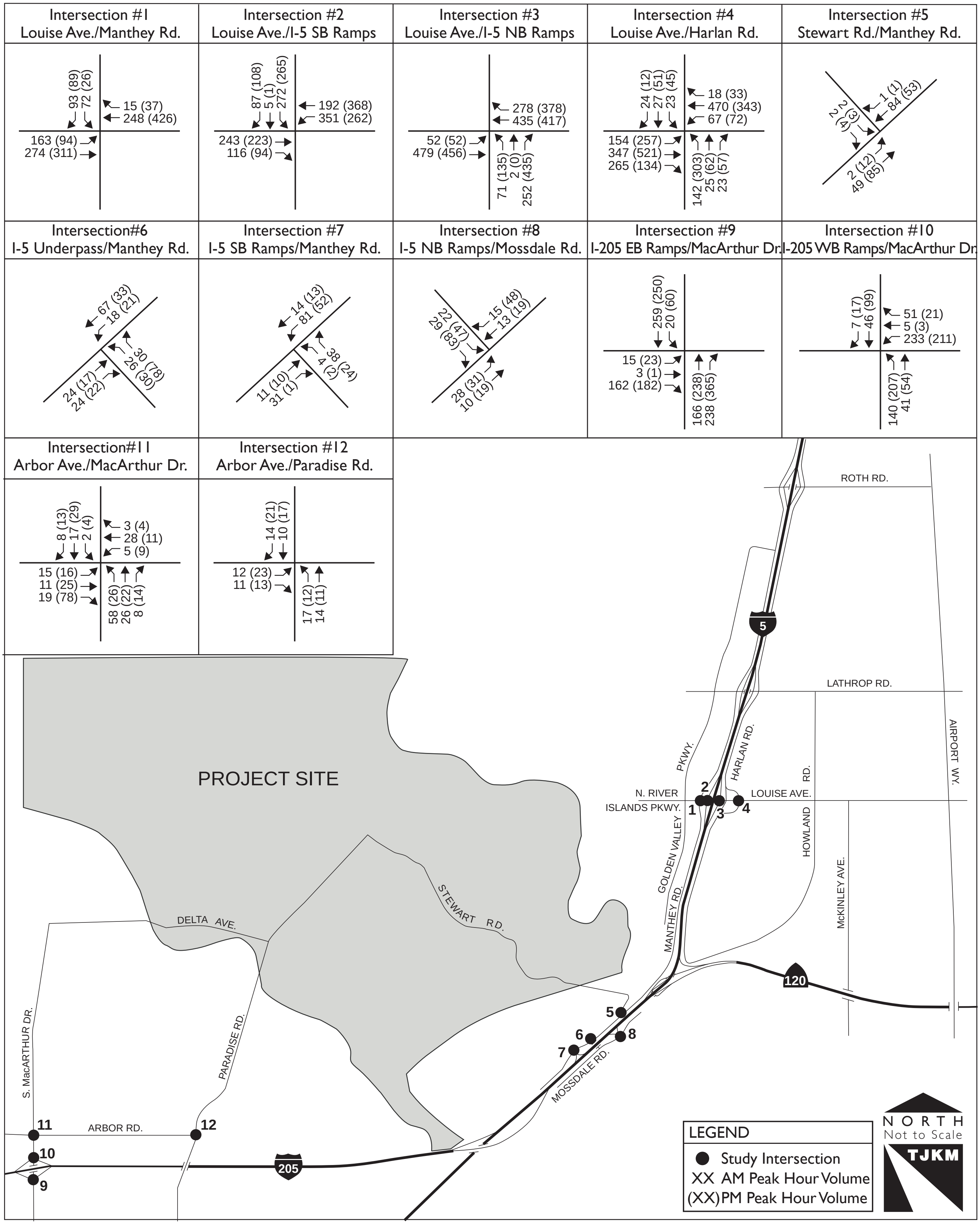


Table VI: Intersection Levels of Service - Existing Conditions

ID	Intersection	Control	Existing Conditions			
			A.M. Peak Hour		P.M. Peak Hour	
			Delay	LOS	Delay	LOS
1	Manthey Road/Louise Avenue	One-Way Stop	27.7	D	17.7	C
2	I-5 Southbound Ramps/Louise Avenue	Signal	24.9	C	15.5	B
3	I-5 Northbound Ramps/Louise Avenue	Signal	8.7	A	10.8	B
4	Harlan Road/Louise Avenue	Signal	15.8	B	20.8	C
5	Manthey Road/Stewart Road	All-Way Stop	7.1	A	7.2	A
6	Manthey Road/I-5 Underpass	One-Way Stop	9.6	A	9.3	A
7	Manthey Road/I-5 Southbound Ramps	One-Way Stop	9.0	A	8.7	A
8	Mossdale Rd/I-5 Northbound Ramps	One-Way Stop	9.3	A	9.6	A
9	MacArthur Drive/I-205 Eastbound Ramps	Signal	10.3	B	9.4	A
10	MacArthur Drive/I-205 Westbound Ramps	Signal	25.2	C	16.3	B
11	MacArthur Drive/Arbor Avenue	All-Way Stop	8.2	A	7.9	A
12	Paradise Road/Arbor Avenue	One-Way Stop	9.0	A	9.1	A

Notes: 1) LOS=Level of Service, Delay = Average control delay per vehicle
2) Signalized and four-way stop controlled intersections – Delay / LOS is for overall intersection
3) Unsignalized one- and two-way stop controlled intersections – Delay / LOS is for critical minor stop-controlled approach.

Roadway Level of Service Analysis (Existing Conditions)

Table VII below shows LOS for the study rural roadway segments under Existing Conditions. Detailed LOS calculations are contained in Appendix C. Currently, all existing study roadway segments are operating at LOS A during the weekday a.m. and p.m. peak hours, which is within acceptable roadway operations standards.

Table VII: Roadway Levels of Service – Existing Conditions

ID	Roadway Segment	A.M. Peak Hour			P.M. Peak Hour		
		Two Way Volume	V/C	LOS	Two Way Volume	V/C	LOS
1	Paradise Rd. (Arbor Ave. to Paradise Cut)	50	0.02	A	72	0.04	A
2	Paradise Rd. (Arbor Ave. to I-205)	52	0.02	A	53	0.03	A
3	Arbor Ave. (Paradise Rd. to MacArthur Dr.)	59	0.03	A	60	0.02	A
4	MacArthur Dr. (Arbor Ave. to I-205)	133	0.05	A	122	0.05	A

Note: V/C = volume to capacity ratio, LOS = Level of Service

Freeway Mainline Level of Service Analysis (Existing Conditions)

TJKM utilized collected existing freeway mainline and ramp volumes to conduct the freeway mainline analysis for Existing Conditions. Table VIII below shows existing LOS for the study freeway mainline sections under Existing Conditions. Detailed LOS calculations are contained in Appendix C. Currently, all freeway mainline segments are operating at LOS D or better, which is within acceptable Caltrans freeway service level standards. It should be noted that since the River Islands SEIR was completed, I-205 was widened from four to six lanes. This widening has improved the unacceptable LOS that had been identified in the DEIR's existing conditions scenario.

Table VIII: Freeway Mainline Levels of Service – Existing Conditions

ID	*Location*	*Direction*	*No. of Lanes*	*A.M. Peak Hour*		*P.M. Peak Hour*	
				Density (pc/mi/ln)	*LOS*	*Density (pc/mi/ln)*	*LOS*
1	I-5 North of Louise Ave. Interchange	NB	3	13.8	B	19.4	C
		SB	3	18.0	C	17.0	B
2	I-5 Between Louise Ave & SR-120	NB	3	13.8	B	20.1	C
		SB	3	18.6	C	16.9	B
3	I-5 Between SR-120 & Manthey/Mossdale Hook Ramps	NB	4	13.1	B	20.8	C
		SB	5	18.4	C	10.7	A
4	I-5 Between Manthey/Mossdale Hook Ramps & I-205	NB	5	10.5	A	16.8	B
		SB	5	18.6	C	10.8	A
5	I-5 Just South of I-205	NB	2	8.9	A	12.6	B
		SB	3	12.0	B	5.5	A
6	I-205 Between I-5 & MacArthur Dr. Interchange	EB	3	11.0	A	19.5	C
		WB	3	18.3	C	12.5	B
7	I-205 West of MacArthur Dr.	EB	3	10.6	A	19.1	C
		WB	3	17.6	B	12.5	B
8	SR-120 Just East of I-5	EB	2	18.0	B	27.6	D
		WB	2	27.4	D	17.8	B

Note: Density in passenger cars per mile per lane, LOS = Level of Service

Freeway Weaving Level of Service Analysis (Existing Conditions)

TJKM utilized collected existing freeway mainline and ramp volumes to additionally conduct an existing freeway weaving section analysis for the same weaving segments analyzed in the River Islands SEIR. Table IX below shows existing LOS for the study freeway weaving sections under Existing Conditions. Detailed LOS calculations are contained in Appendix C. Currently, all weaving segments are operating acceptably at LOS D or better, with the exception of the I-5 Northbound weaving section between the Mossdale Road on-ramp and SR 120 off-ramp (LOS E in the p.m. peak hour).

Table IX: Freeway Weaving Levels of Service – Existing Conditions

Northbound I-5		***A.M. Peak Hour***		***P.M. Peak Hour***	
ID	***Location***	***Weaving Density (pc/mi/ln)***	***LOS***	***Weaving Density (pc/mi/ln)***	***LOS***
1	From I-205 Merge to Mossdale Road Off-Ramp Diverge (3,160 feet)	16.4	B	34.3	D
2	From Mossdale Road On-Ramp Merge to SR-120 Diverge (1,620 feet)	21.4	C	**36.0**	**E**
Southbound I-5		***A.M. Peak Hour***		***P.M. Peak Hour***	
ID	***Location***	***Weaving Density (pc/mi/ln)***	***LOS***	***Weaving Density (pc/mi/ln)***	***LOS***
1	From SR-120 Merge to Manthey Road Off-Ramp Diverge (2,200 feet)	26.3	C	17.9	B
2	From Manthey Road On-Ramp Merge to I-205 Diverge (2,900 feet)	32.8	D	20.4	C

Note: Density in passenger cars per mile per lane, LOS = Level of Service
Bold indicates operations below operational standards

Freeway Ramp Merge / Diverge Level of Service Analysis (Existing Conditions)
Table X shows the results of a freeway ramp merge / diverge LOS analysis of the study freeway on-ramps and off-ramps under Existing Conditions. Detailed LOS calculations are contained in Appendix C. Currently, all ramp merge and diverge locations are operating at LOS D or better, which is within acceptable Caltrans standards.

Table X: Freeway Ramp Levels of Service – Existing Conditions

ID	***Interchange***	***Ramp***	***Condition***	***Ramp Lanes***	***Freeway Lanes***	***A.M. Peak Hour***	***P.M. Peak Hour***
1	I-5/Louise Ave.	NB Off	Diverge	1	3	C	D
		NB On	Merge	1	3	C	D
		SB Off	Diverge	1	3	C	C
		SB On	Merge	1	3	C	C
2	I-5/Manthey Rd.	SB Off	Diverge	1	5	B	B
		SB On	Merge	1	5	C	B
3	I-5/Mossdale Rd.	NB Off	Diverge	1	5	B	C
		NB On	Merge	1	4	B	C
4	I-205/MacArthur Dr.	EB Off	Diverge	1	3	B	C
		EB On	Merge	1	3	B	C
		WB Off	Diverge	1	3	C	B
		WB On	Merge	1	3	C	B

Note: Density in passenger cars per mile per lane, LOS = Level of Service

Year 2017 Baseline Conditions

This section details expected traffic conditions under Year 2017 Baseline Conditions. Under this scenario and for purposes of this traffic analysis, Phases 1 and 2a of the River Islands Development are assumed to be completed, as well as additional buildout development in the surrounding planning areas and neighborhoods of West Lathrop, Mossdale Village, and Central Lathrop. River Islands Phases 1 and 2a are expected to consist of approximately 4,284 single- and multi-family residential units, approximately three million square feet of commercial uses (retail, service, office, and related uses), and supporting services including schools and a fire station.

The 2017 Baseline scenario is used as basis for comparing with the Year 2017 With Action Conditions, a scenario in which approximately seven percent of Phase 2B of the River Islands Development is additionally assumed to be complete for the purposes of the EIS traffic and air quality analysis. The With Action scenario will identify potential long-term (cumulative) traffic impacts expected with partial buildout of River Islands Phase 2B in Year 2017.

Area Development Assumptions

TJKM developed a combined Lathrop / SJCOG model that includes refined and updated land use and transportation network assumptions in the River Islands Development study area. This includes assumptions from the 2006 Lathrop TMP. The TMP assumed that developments in the vicinity of River Islands in the West Lathrop, Mossdale Village, and Central Lathrop planning areas would be substantially complete by Year 2011. However, due to current economic conditions in the region, TJKM conducted a subsequent analysis in 2009 that compared the current annual development growth in these planning areas with comparable annual growth rates in the SJCOG model. The analysis found that the current pace of development in these planning areas was slower than the SJCOG growth prediction.

Based on the slower actual growth rate determined above, it was concluded that full development of these planning areas would take another six years (i.e. 2017). With the concurrence of SJCOG and City of Lathrop staff, TJKM therefore assumed for the purposes of travel demand model runs for this EIS traffic analysis that all development projected to be built by 2011 in the Lathrop planning areas outside River Islands, as well as San Joaquin County as a whole, would now occur by 2017.

Appendix D includes a list of developments in the Mossdale Village, West Lathrop, and Central Lathrop areas that are in proximity to the proposed River Islands Development, which are now anticipated to be complete for the 2017 Baseline traffic scenario.

Roadway Network Assumptions

TJKM based the analysis of Year 2017 traffic conditions on future local roadway network assumptions. Based on the concurrence of San Joaquin Council of Governments (SJCOG) and City of Lathrop staff and due to current economic conditions, study area roadway improvements that were originally anticipated to be in place by Year 2012 per the Lathrop Traffic Monitoring Program are now considered to be in place by Year 2017. Similarly, roadway improvements within San Joaquin County in the 2007 SJCOG Regional Transportation Plan (RTP) that were anticipated for completion in Year 2011 are now considered to be in place six years later (i.e., 2017).

The RTP is a transportation planning document for San Joaquin County that was developed with the consensus of SJCOG, the City of Lathrop, Caltrans, and other County stakeholders. The Year 2017 Baseline Conditions scenario includes priority transportation improvements identified in the

RTP that are expected to be funded primarily by the recent Measure K 1/2-cent sales tax renewal, the San Joaquin County Regional Transportation Impact Fee, and statewide Proposition 1B funds. The following programmed and funded roadway improvements located in the vicinity of the River Islands Development are expected to be in place by Year 2017:

- SR 120: Widening from four to six lanes (inside) between I-5 and SR 99.
- Reconstructed I-5 / Louise Avenue interchange that is a modified diamond with new westbound to southbound loop ramp
- Construction of new interchange at I-205 / Paradise Road / Chrisman Road

Turning movement volumes, traffic controls, and lane geometries anticipated for intersections both external and internal to the River Islands development for Year 2017 Baseline Conditions are shown in Figure 5 and Figure 6, respectively. The project model was executed for this baseline scenario given the above roadway improvements and River Islands and other area development expected to be in place by Year 2017. The intersection traffic controls and lane geometries are based on those anticipated in the River Islands SEIR, as well as the 2006 Lathrop Traffic Monitoring Program (TMP) and subsequent TJKM traffic studies of internal River Islands intersections. For the Golden Valley Parkway / River Islands Parkway intersection and the two I-5 / Louise Avenue ramp intersections, TJKM developed buildout intersection geometries consistent with the I-5 / Louise Avenue Project Study Report (PSR) and anticipated retail commercial development in the vicinity that provide the basis for analysis.

Intersection Level of Service Analysis Results (Year 2017 Baseline Conditions)
Table XI shows the results of the intersection LOS analysis conducted for Year 2017 Baseline Conditions. Detailed calculation sheets are contained in Appendix E.

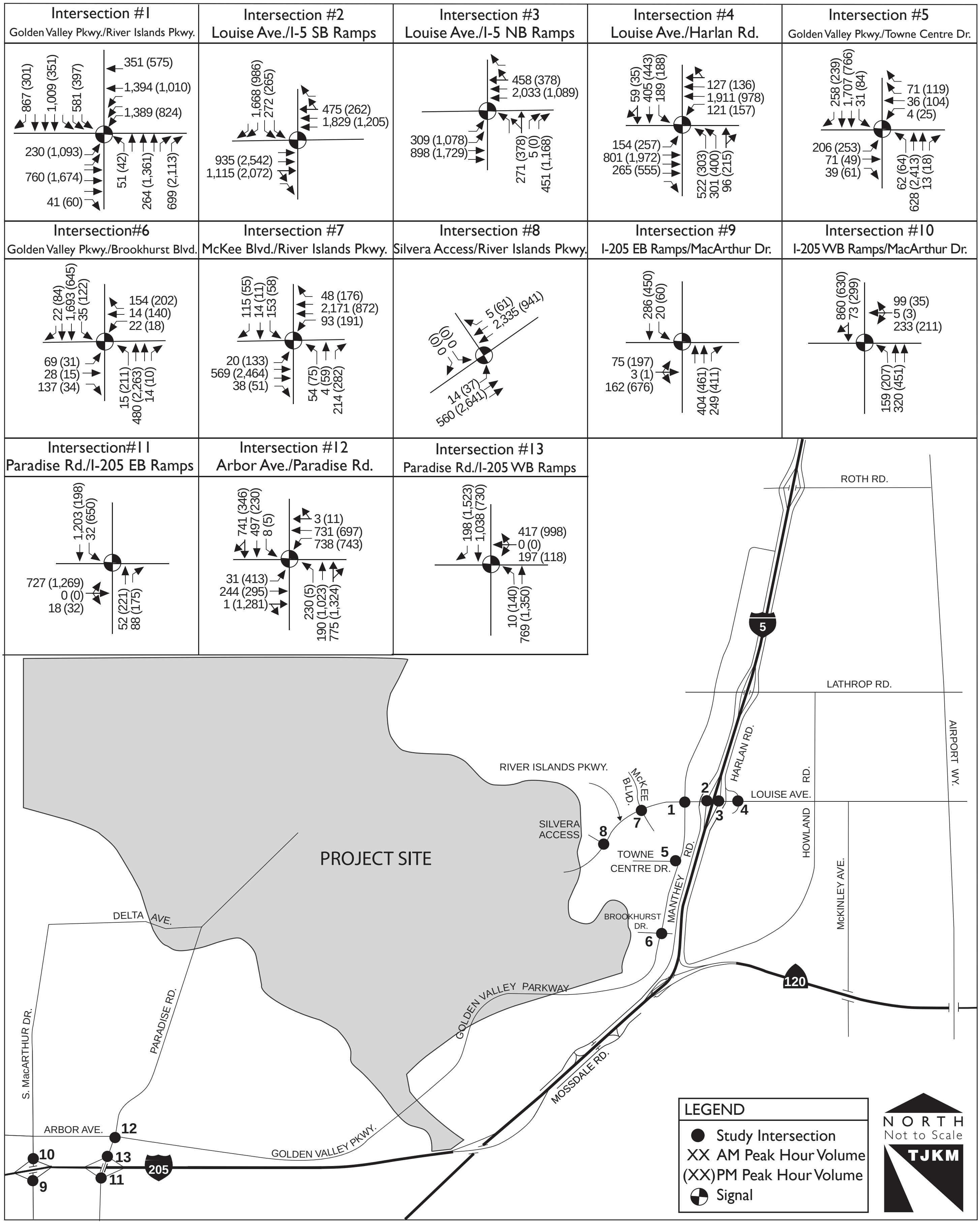
The following intersections are expected to operate unacceptably under this scenario:

- Golden Valley Parkway / River Islands Parkway (LOS F during the p.m. peak hour)
- I-5 Southbound Ramps / Louise Avenue (LOS E during both peak hours)
- I-5 Northbound Ramps / Louise Avenue (LOS E during the p.m. peak hour)
- Harlan Road / Louise Avenue (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour)
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour)
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours)
- Paradise Road / Arbor Avenue (LOS F during both peak hours)
- Paradise Road / I-205 Westbound Ramps (LOS F during the p.m. peak hour)

City of Lathrop - River Islands Phase 2 EIS

Figure 5

2017 Baseline Conditions (External Intersections)



City of Lathrop - River Islands Phase 2 EIS
2017 Baseline Conditions (Internal Intersections)

Figure 6

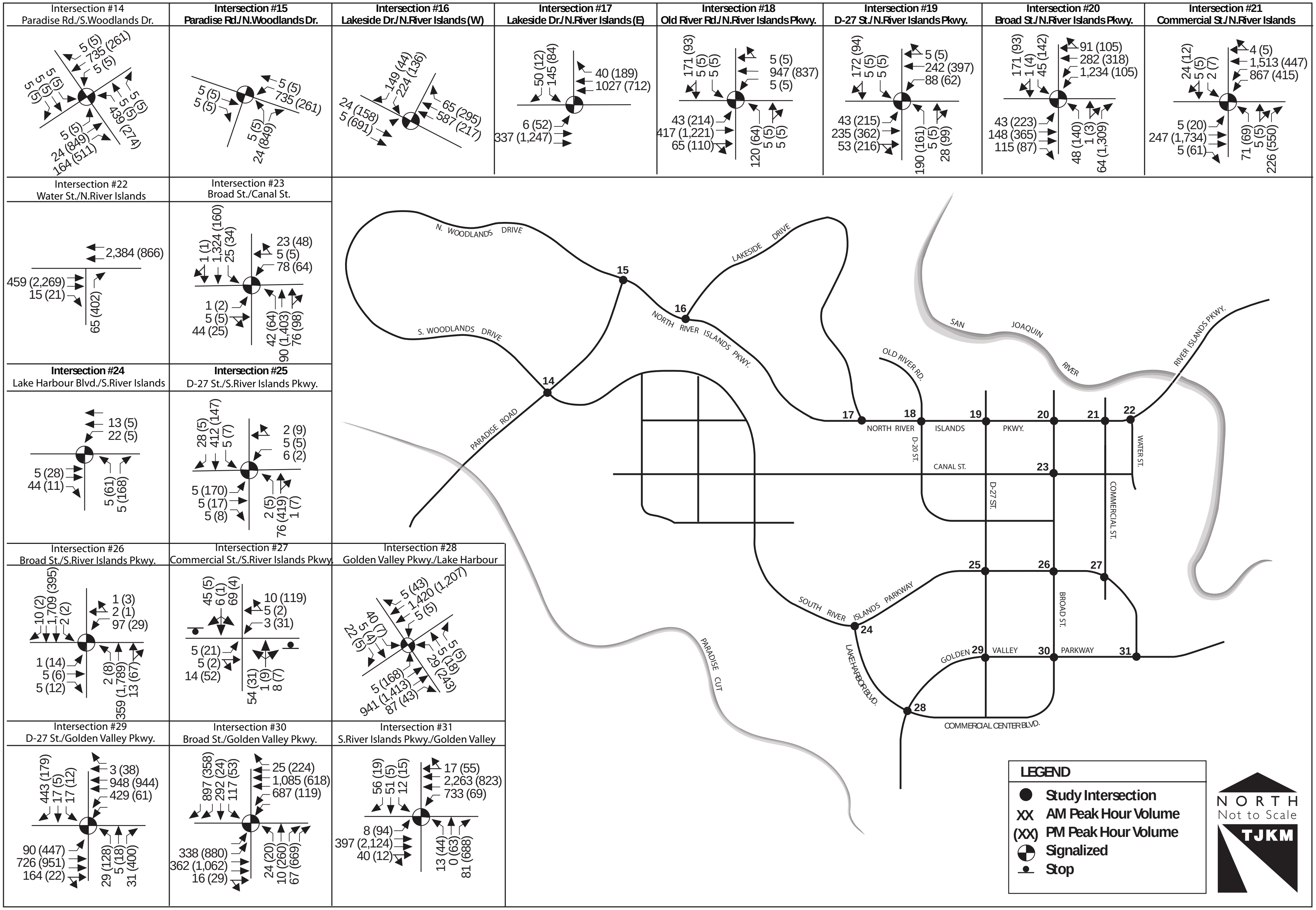


Table XI: Intersection Levels of Service – Year 2017 Baseline Conditions

ID	*Intersection*	*Control*	*2017 Baseline Conditions*			
			A.M. Peak Hour		*P.M. Peak Hour*	
			Delay	*LOS*	*Delay*	*LOS*
1	Golden Valley Parkway/River Islands Parkway	Signal	48.8	D	120+	**F**
2	I-5 Southbound Ramps/Louise Avenue	Signal	68.8	**E**	80.0	**E**
3	I-5 Northbound Ramps/Louise Avenue	Signal	13.5	B	72.8	**E**
4	Harlan Road/Louise Avenue	Signal	78.6	**E**	95.6	**F**
5	Golden Valley Parkway/Towne Centre Drive	Signal	19.9	B	94.3	**F**
6	Golden Valley Parkway/Brookhurst Boulevard	Signal	10.9	B	30.7	C
7	McKee Boulevard/River Islands Parkway	Signal	18.8	B	51.4	D
8	Silvera Access/River Islands Parkway	Signal	0.5	A	1.4	A
9	MacArthur Drive/I-205 Eastbound Ramps	Signal	10.2	B	41.7	D
10	MacArthur Drive/I-205 Westbound Ramps	Signal	32.4	C	47.0	D
11	Paradise Road/I-205 Eastbound Ramps	Signal	107.9	**F**	120+	**F**
12	Paradise Road/Arbor Avenue	Signal	120+	**F**	120+	**F**
13	Paradise Road/I-205 Westbound Ramps	Signal	53.0	D	120+	**F**
14	Paradise Road/S. Woodlands Drive	Signal	14.3	B	15.6	B
15	Paradise Road/N. Woodlands Drive	Signal	3.0	A	20.5	C
16	Lakeside Drive/N. River Islands Parkway (W)	Signal	13.4	B	10.3	B
17	Lakeside Drive/N. River Islands Parkway (E)	Signal	6.9	A	5.0	A
18	Old River Road/N. River Islands Parkway	Signal	13.1	B	11.1	B
19	D-27 Street/N. River Islands Parkway	Signal	23.5	C	22.3	C
20	Broad Street/N. River Islands Parkway	Signal	15.6	B	30.0	C
21	Commercial Street/N. River Islands Parkway	Signal	11.8	B	21.7	C
22	Water Street/N. River Islands Parkway	Free	7.2	A	13.1	B
23	Broad Street/Canal Street	Signal	4.1	A	4.6	A
24	Lake Harbor Boulevard/S. River Islands Parkway	Signal	15.3	B	9.5	A
25	D-27 Street/S. River Islands Parkway	Signal	21.6	C	19.7	B
26	Broad Street/S. River Islands Parkway	Signal	8.2	A	7.9	A
27	Commercial Street/S. River Islands Parkway	Two-way Stop	9.5	A	9.9	A
28	Golden Valley Parkway/Lake Harbor Boulevard	Signal	11.6	B	18.1	B
29	D-27 Street/Golden Valley Parkway	Signal	19.9	B	28.6	C
30	Broad Street/Golden Valley Parkway	Signal	18.3	B	24.9	C
31	S. River Islands Parkway/Golden Valley Parkway	Signal	10.4	B	50.9	D

Notes: 1) LOS=Level of Service, Delay = Average control delay per vehicle
2) Signalized and four-way stop controlled intersections – Delay / LOS is for overall intersection
3) Unsignalized one- and two-way stop controlled intersections – Delay / LOS is for critical minor stop-controlled approach.
4) **Bold** indicates unacceptable operational conditions.

Year 2017 With Action Conditions

This Scenario is similar to Year 2017 Baseline Conditions, but with the addition of traffic generated by a portion of Phase 2B of the River Islands Development. The assumed roadway network and nearby area development is assumed to be the same under this traffic scenario as for Year 2017 Baseline Conditions.

Project Land Uses

For the purposes of the EIS traffic analysis, it is assumed under Year 2017 With Action Conditions, approximately seven percent of Phase 2B of the River Islands Development is built. Under partial Phase 2B completion in Year 2017, it is estimated that 470 residential units would be built (271 single-family and 199 multi-family), along with approximately 140,000 square feet of commercial development (seven percent of approximately two million square feet under Phase 2B buildout). Table XII shows the estimated land use totals within River Islands assumed in the project travel demand model under this scenario. The totals include both baseline Phase 1 / 2A and partial Phase 2B (With Action) development land uses. The neighborhoods listed are shown in Figure 2. Appendix F contains detailed information for each traffic analysis zone (TAZ) representing Year 2017 River Islands Development land use in the model, including residential units and commercial jobs.

Table XII: River Islands Development Assumptions (Year 2017 With Action Conditions)

Development Phase	*Neighborhood*	*Residential Units*		*Commercial Area (KSF)*		
		SF	*MF*	*Retail*	*Service*	*Other*
Phase 1 / 2A (2017 Baseline Condition)	East Village	2,103	203	0	0	0
	Employment Center	0	0	161	920	1,539
	Lakeside	1,000	0	0	0	0
	Town Center	636	344	213	118	48
	Phase 1 / 2A Total	**3,739**	**547**	**374**	**1,038**	**1,588**
Phase 2B (2017 With Action Condition)	Employment Center	0	0	9	54	69
	Lake Harbor	21	14	0	0	0
	Old River Road	49	14	0	0	0
	West Village	95	95	4	2	2
	Woodlands	106	77	0	0	0
	Phase 2B Total	**271**	**199**	**13**	**56**	**71**
Overall Totals		**4,010**	**746**	**388**	**1,094**	**1,658**

Notes: 1) SF = single-family residential, MF = multi-family residential; KSF = 1,000 square feet
2) Commercial square footage based proportionally on projected jobs by neighborhood (see Appendix F) and approximately 3 million square feet (sq. ft.) of Phase 1 / 2A commercial development and 140,000 sq. ft. of Phase 2B commercial development.

Project Site Access and Circulation

Regional freeway access to the River Islands Development would be provided from I-5 at the Louise Avenue interchange and I-205 at the existing MacArthur Drive interchange and the future Paradise Road / Chrisman Road interchange. Local site access to River Islands will be provided by four bridge crossings. From the northeast, River Islands Parkway and Golden Valley Parkway will be extended across the San Joaquin River from their current termini within Mossdale Village, with both crossings consisting of four lanes. The River Islands Parkway bridge will enter the Phase I mixed-use neighborhoods of Town Center and East Village, while the northeast Golden Valley Parkway crossing will directly access the Employment Center neighborhood of Phase 1.

From the southwest, two bridges will span Paradise Cut into the River Islands Development. The existing Paradise Road crossing will be widened from two to four lanes and enter the primarily residential Woodlands and mixed-use West Village neighborhoods of Phase 2B. Golden Valley Parkway, after passing through the Employment Center, will cross over Paradise Cut via another four-lane bridge and continue to its future terminus at the Paradise Road / Arbor Avenue intersection, located just north of I-205. Local land uses within the River Islands Development will be connected by primary arterial roadways that include North River Islands Parkway, South River Islands Parkway, Golden Valley Parkway, North Woodlands Drive, and South Woodlands Drive.

Project Trips

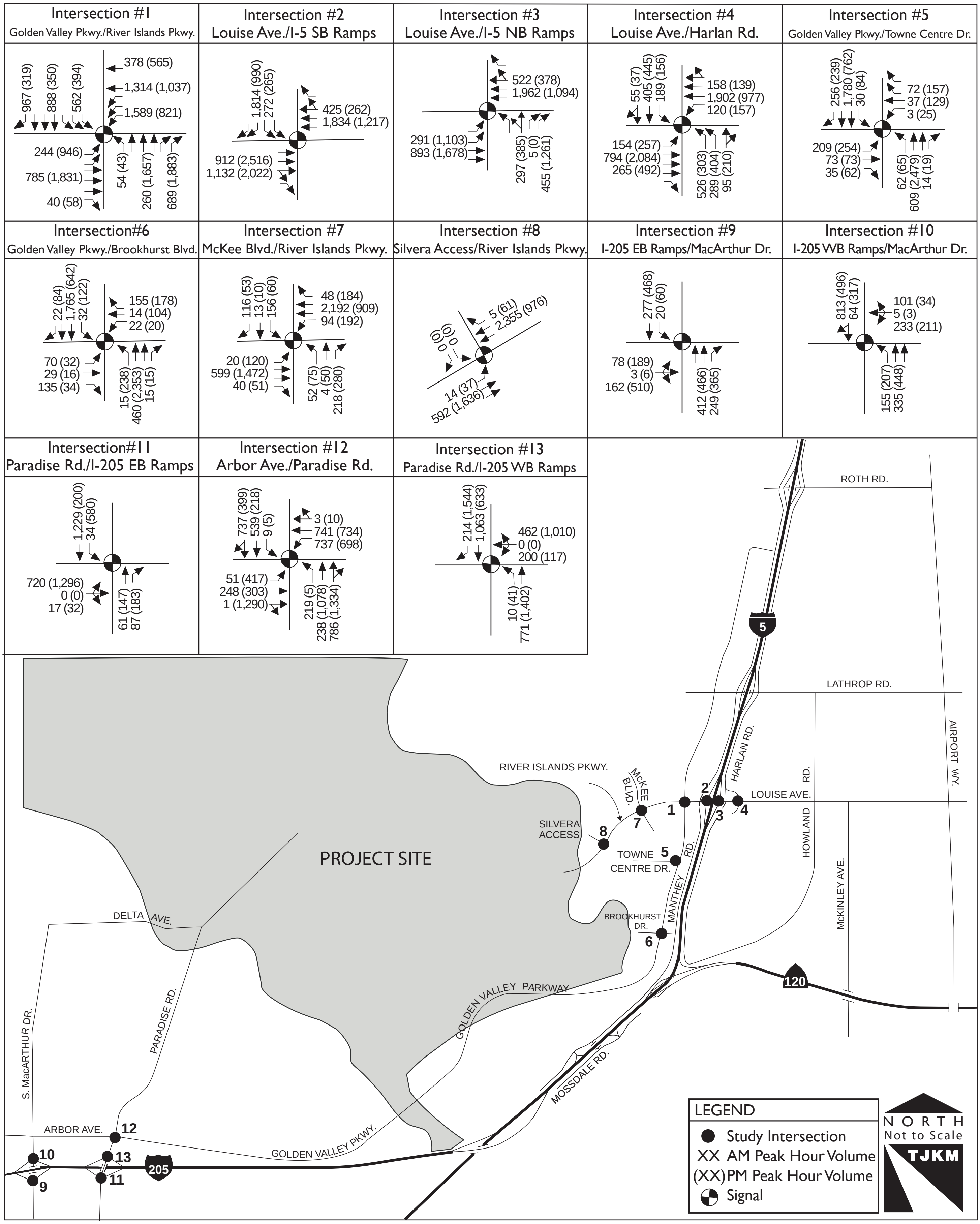
Project traffic for the partial Phase 2B development was generated by the model and was added to the Year 2017 Baseline volumes to generate volumes for Year 2017 With Action Conditions. Turning movement volumes, traffic controls, and lane geometries anticipated for intersections both external and internal to the River Islands development for Year 2017 With Action Conditions are shown in Figure 7 and Figure 8, respectively. The intersection traffic controls and lane geometries assumed are the same as under the Year 2017 Baseline scenario.

Appendix F additionally includes an estimation of Year 2017 trip rates contained in the model for each River Islands land use type, both without and with partial completion of Phase 2B. Also included are vehicle miles traveled (VMT) estimates, both overall and by trip purpose (home-based work, home-based other, etc.).

City of Lathrop - River Islands Phase 2 EIS

2017 With Action Conditions (External Intersections)

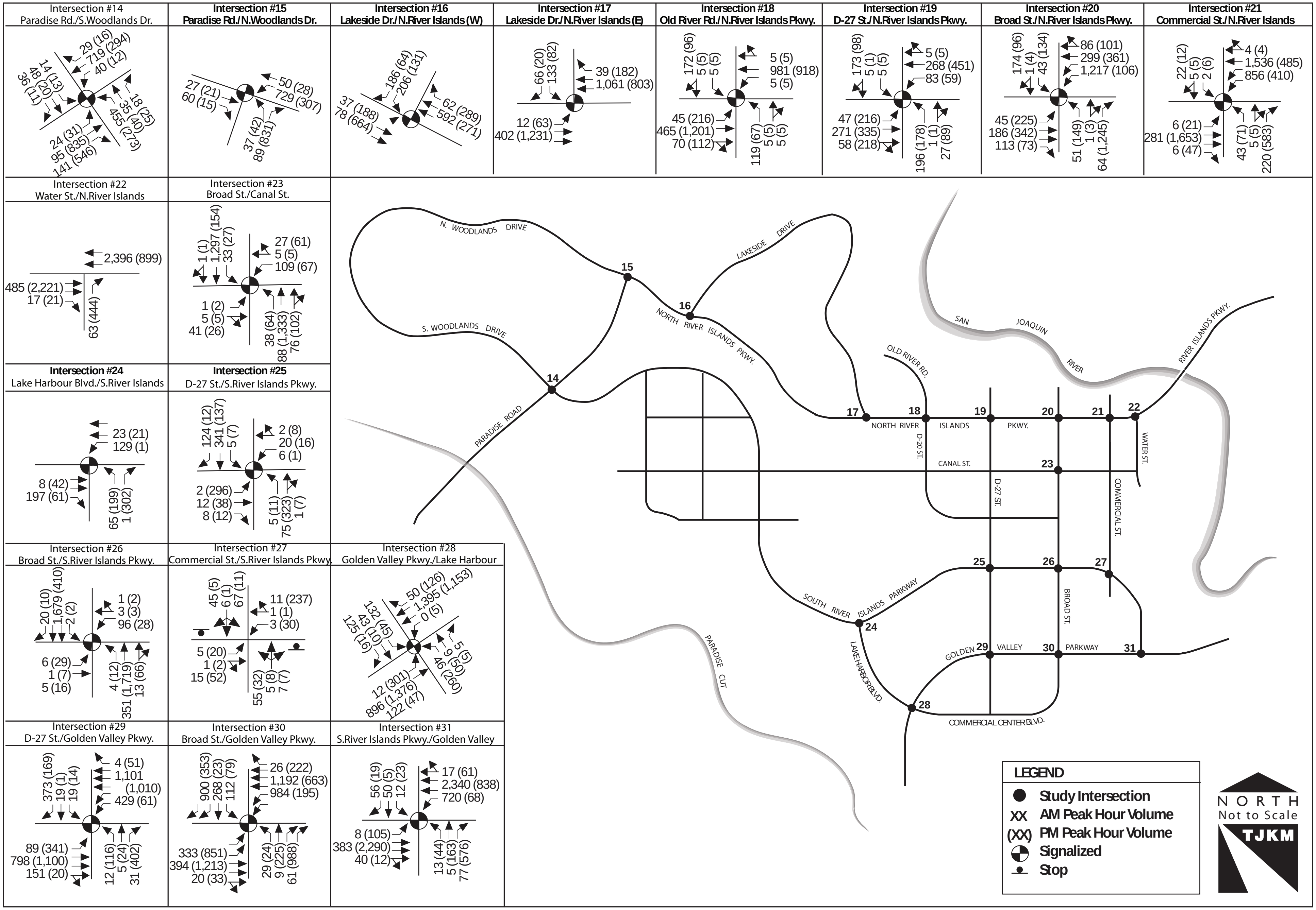
Figure 7



City of Lathrop - River Islands Phase 2 EIS

2017 With Action Conditions (Internal Intersections)

Figure 8



Intersection Level of Service Analysis Results (Year 2017 With Action Conditions)
The intersection LOS analysis results for both Year 2017 Baseline and Year 2017 With Action Conditions are summarized in Table XIII. Detailed calculation sheets are contained in Appendix G.

The following intersections are expected to operate unacceptably under this scenario:

- Golden Valley Parkway / River Islands Parkway (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour)
- I-5 Southbound Ramps / Louise Avenue (LOS F during the a.m. peak hour and LOS E during the p.m. peak hour)
- I-5 Northbound Ramps / Louise Avenue (LOS F during the p.m. peak hour)
- Harlan Road / Louise Avenue (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour)
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour)
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours)
- Paradise Road / Arbor Avenue (LOS F during both peak hours)
- Paradise Road / I-205 Westbound Ramps (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour)

Table XIII: Intersection Levels of Service – Year 2017 With Action Conditions

ID	*Intersection*	*Control*	*2017 Baseline Conditions*				*2017 With Action Conditions*			
			A.M. Peak Hour		*P.M. Peak Hour*		*A.M. Peak Hour*		*P.M. Peak Hour*	
			Delay	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*
1	Golden Valley Parkway / River Islands Parkway	Signal	48.8	D	120+	**F**	78.1	**E** *	120+	**F** *
2	I-5 Southbound Ramps / Louise Avenue	Signal	68.8	**E**	80.0	**E**	85.5	**F** *	75.6	**E** *
3	I-5 Northbound Ramps / Louise Avenue	Signal	13.5	B	72.8	**E**	15.1	B	86.6	**F** *
4	Harlan Road / Louise Avenue	Signal	78.6	**E**	95.6	**F**	76.4	**E**	95.3	**F**
5	Golden Valley Parkway / Towne Centre Drive	Signal	19.9	B	94.3	**F**	22.6	C	99.4	**F**
6	Golden Valley Parkway / Brookhurst Boulevard	Signal	10.9	B	30.7	C	10.8	B	31.7	C
7	McKee Boulevard / River Islands Parkway	Signal	18.8	B	51.4	D	17.6	B	23.8	C
8	Silvera Access / River Islands Parkway	Signal	0.5	A	1.4	A	0.5	A	0.4	A
9	MacArthur Drive / I-205 Eastbound Ramps	Signal	10.2	B	41.7	D	8.5	A	23.1	C
10	MacArthur Drive / I-205 Westbound Ramps	Signal	32.4	C	47.0	D	30.4	C	36.6	D
11	Paradise Road / I-205 Eastbound Ramps	Signal	107.9	**F**	120+	**F**	111.6	**F**	120+	**F**
12	Paradise Road / Arbor Avenue	Signal	120+	**F**	120+	**F**	120+	**F**	120+	**F**
13	Paradise Road / I-205 Westbound Ramps	Signal	53.0	D	120+	**F**	64.4	**E**	120+	**F**

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ID	Intersection	Control	2017 Baseline Conditions				2017 With Action Conditions			
			A.M. Peak Hour		P.M. Peak Hour		A.M. Peak Hour		P.M. Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
14	Paradise Road / S. Woodlands Drive	Signal	14.3	B	15.6	B	19.7	B	18.1	B
15	Paradise Road / N. Woodlands Drive	Signal	3.0	A	20.5	C	8.9	A	21.0	C
16	Lakeside Drive / N. River Islands Parkway (W)	Signal	13.4	B	10.3	B	13.2	B	10.1	B
17	Lakeside Drive / N. River Islands Parkway (E)	Signal	6.9	A	5.0	A	6.0	A	4.6	A
18	Old River Road / N. River Islands Parkway	Signal	13.1	B	11.1	B	13.4	B	10.1	B
19	D-27 Street / N. River Islands Parkway	Signal	23.5	C	22.3	C	24.1	C	19.1	B
20	Broad Street / N. River Islands Parkway	Signal	15.6	B	30.0	C	19.5	B	19.1	B
21	Commercial Street / N. River Islands Parkway	Signal	11.8	B	21.7	C	11.2	B	21.7	C
22	Water Street / N. River Islands Parkway	Free	7.2	A	13.1	B	7.2	A	12.0	B
23	Broad Street / Canal Street	Signal	4.1	A	4.6	A	5.6	A	4.3	A
24	Lake Harbor Boulevard / S. River Islands Parkway	Signal	15.3	B	9.5	A	14.2	B	5.2	A
25	D-27 Street / S. River Islands Parkway	Signal	21.6	C	19.7	B	17.6	B	20.1	C
26	Broad Street / S. River Islands Parkway	Signal	8.2	A	7.9	A	7.0	A	7.0	A
27	Commercial Street / S. River Islands Parkway	Two-way Stop	9.5	A	9.9	A	9.4	A	10.1	B
28	Golden Valley Parkway / Lake Harbor Boulevard	Signal	11.6	B	18.1	B	14.4	B	22.3	C
29	D-27 Street / Golden Valley Parkway	Signal	19.9	B	28.6	C	17.7	B	24.2	C
30	Broad Street / Golden Valley Parkway	Signal	18.3	B	24.9	C	19.3	B	21.3	C
31	S. River Islands Parkway / Golden Valley Parkway	Signal	10.4	B	50.9	D	10.3	B	39.3	D

Notes: 1) LOS=Level of Service, Delay = Average control delay per vehicle
2) Signalized and four-way stop controlled intersections – Delay / LOS is for overall intersection
3) Unsignalized one- and two-way stop controlled intersections – Delay / LOS is for critical minor stop-controlled approach.
4) **Bold** indicates unacceptable operational conditions.
* Assumed geometry is buildout and cannot be physically expanded further. Impacts/mitigations discussed in next section.

Intersection Significant Impacts and Mitigation Measures (Year 2017 With Action Conditions)
Based on the standards of significance, the partial build of River Islands Phase 2B would have a significant impact on several intersections. The significant impacts and potential mitigation measures for each intersection are as follows:

- Golden Valley Parkway / River Islands Parkway - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on City of Lathrop standards of significance, since it would worsen a.m. peak hour operations from LOS D to E and also worsen the baseline LOS F during the p.m. peak hour by increasing intersection traffic from the baseline by one percent or more.
    - *Mitigation:* The baseline traffic controls and lane geometry at this intersection represent buildout conditions due to anticipated buildout commercial development immediately adjacent to this intersection. Since it is physically and potentially financially infeasible to expand this intersection to mitigate service levels, alternative mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this is a significant and unavoidable impact.
- I-5 Southbound Ramps / Louise Avenue - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans and City of Lathrop standards of significance, since it would worsen a.m. peak hour operations from LOS E to F and increase intersection traffic from the baseline by one percent or more.
    - *Mitigation:* The baseline traffic controls and lane geometry at this intersection represent buildout conditions due to anticipated buildout commercial development immediately adjacent to this intersection. Since it is physically and potentially financially infeasible to expand this intersection to mitigate service levels, alternative mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this is a significant and unavoidable impact.
- I-5 Northbound Ramps / Louise Avenue - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans and City of Lathrop standards of significance, since it would worsen p.m. peak hour operations from LOS E to F and increase intersection traffic from the baseline by one percent or more.
    - *Mitigation:* The baseline traffic controls and lane geometry at this intersection represent buildout conditions due to anticipated buildout commercial development immediately adjacent to this intersection. Since it is physically and potentially financially infeasible to expand this intersection to mitigate service levels, alternative mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this is a significant and unavoidable impact.
- Harlan Road / Louise Avenue - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on City of Lathrop standards of significance, since it would increase intersection traffic from the baseline by one percent or more for the a.m. peak (LOS E) and p.m. peak (LOS F) hours.

- *Mitigation:* Add one eastbound left turn lane, one northbound through lane, and one westbound right turn lane. This mitigation would result in LOS D during both the a.m. and p.m. peak hour, which is within acceptable City of Lathrop standards. Therefore, this impact would be mitigated to a less than significant level.

- Golden Valley Parkway / Towne Centre - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on City of Lathrop standards of significance, since it would worsen p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation:* Convert the northbound right turn lane to shared through/right turn lane. This mitigation would result in LOS C during the a.m. peak hour and LOS D during the p.m. peak hour, which is within acceptable City of Lathrop standards. Therefore, this impact would be mitigated to a less than significant level.
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours) - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans standards of significance, since it would worsen a.m. and p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation:* Add one eastbound left turn lane and one northbound through lane. This mitigation would result in LOS D during both peak hours, which is within acceptable Caltrans standards. Therefore, this impact would be mitigated to a less than significant level.
- Paradise Road / Arbor Avenue (LOS F during both peak hours) - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on San Joaquin County standards of significance, since it would worsen a.m. and p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation*: Add one eastbound free right turn lane; add one westbound left turn lane and one westbound right turn lane; add two northbound right turn lanes; and add two southbound right turn lanes. This mitigation would result in LOS C during the a.m. peak hour, which is within acceptable San Joaquin County standards. However, the mitigation would also result in LOS D during the p.m. peak hour, which would still exceed San Joaquin County operational standards of LOS C or better. Since it is potentially physically and financially infeasible to further expand this intersection to mitigate service levels, alternative mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this impact is expected to remain significant and unavoidable.
- Paradise Road / I-205 Westbound Ramps - the partial build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans standards of significance, since it would worsen a.m. peak hour operations from LOS D to LOS E and worsen p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation:* Add one westbound right turn lane and one northbound through lane, and make the southbound right turn a free movement. This mitigation would result in LOS B during the a.m. peak hour and LOS D during the p.m. peak hour, which is within acceptable Caltrans standards. Therefore, this impact would be mitigated to a less than significant level.

Table XIV provides a summary of the resulting mitigated LOS for impacted study intersections as described above under Year 2017 With Action Conditions. Detailed analysis sheets are included in Appendix G. Figure 9 illustrates the proposed intersection mitigations under this scenario.

Table XIV: Mitigated Intersection Levels of Service – Year 2017 With Action Conditions

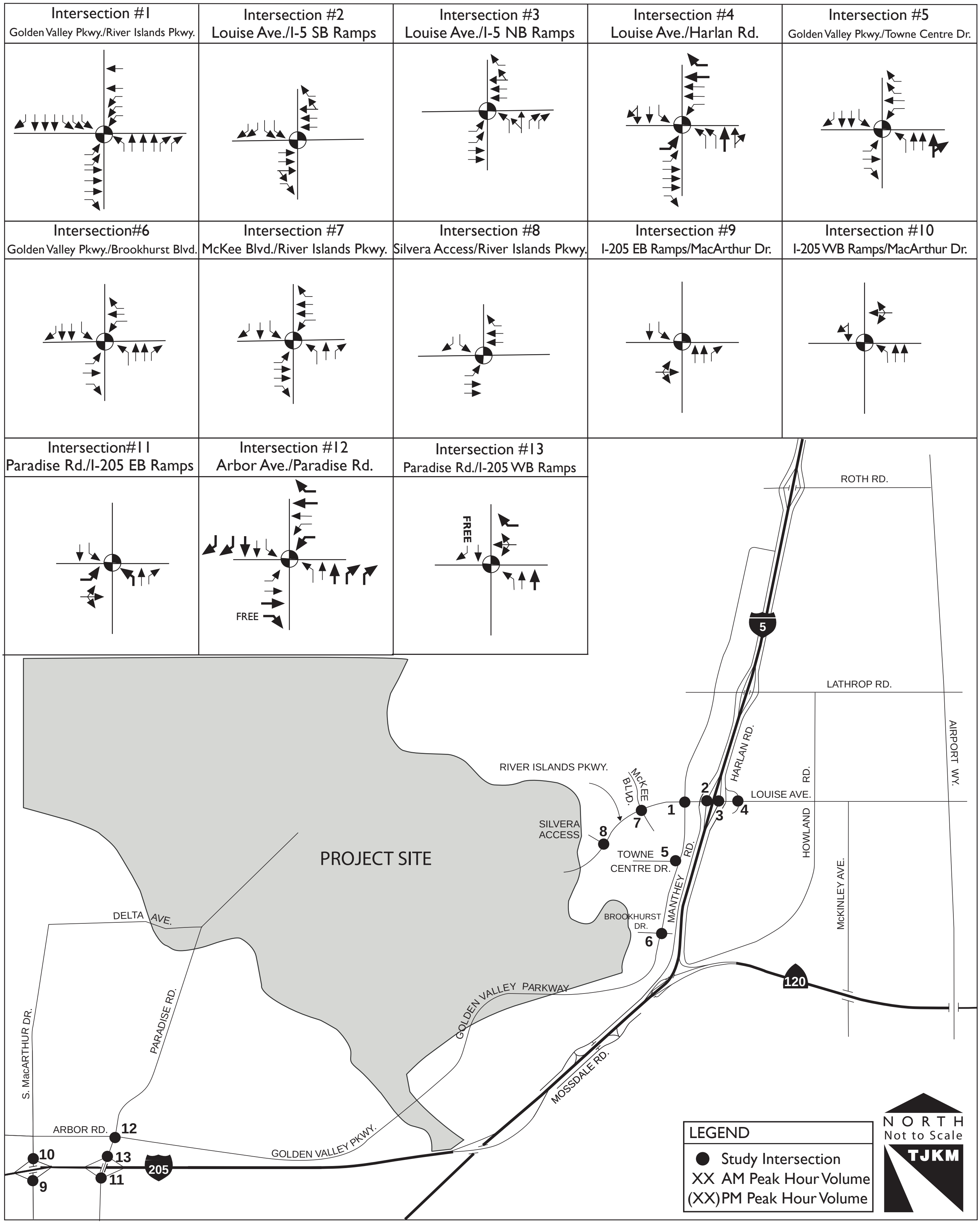
ID	Intersection	Control	Mitigated 2017 With Action Conditions			
			A.M. Peak Hour		P.M. Peak Hour	
			Delay	LOS	Delay	LOS
1	Golden Valley Parkway/River Islands Parkway	Signal	78.1	**E** *	127.7	**F ***
2	I-5 Southbound Ramps/Louise Avenue	Signal	85.5	**F ***	75.6	**E ***
3	I-5 Northbound Ramps/Louise Avenue	Signal	15.1	B	86.6	**F ***
4	Harlan Road/Louise Avenue	Signal	53.3	D	49.3	D
5	Golden Valley Parkway/Towne Centre Drive	Signal	21.5	C	35.3	D
11	Paradise Road/I-205 Eastbound Ramps	Signal	45.2	D	49.4	D
12	Paradise Road/Arbor Avenue	Signal	32.9	C	35.5	D
13	Paradise Road/I-205 Westbound Ramps	Signal	19.2	B	44.0	D

Notes: 1) LOS=Level of Service, Delay = Average control delay per vehicle
2) Signalized intersections – Delay / LOS is for overall intersection
3) **Bold** indicates unacceptable operational conditions. Further widening of Paradise Road / Arbor Avenue intersection (LOS D in the p.m. peak hour with mitigation) is subject to physical feasibility, programming, and funding. Alternative mitigations such as transportation demand management (TDM) measures are recommended, but such measures may still result in significant and unavoidable impacts.
* Assumed geometry is buildout and cannot be physically expanded further. Alternative mitigations such as TDM measures are recommended, but such measures may still result in significant and unavoidable impacts.

City of Lathrop - River Islands Phase 2 EIS

2017 With Action Conditions (External Intersections) - Proposed Mitigations

Figure 9



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Year 2031 Baseline Conditions

This section details expected traffic conditions under Year 2031 Baseline Conditions. Under this scenario and for purposes of this traffic analysis, Phases 1 and 2a of the River Islands Development are assumed to be completed, as well as additional buildout development in the surrounding planning areas and neighborhoods of West Lathrop, Mossdale Village, and Central Lathrop. River Islands Phases 1 and 2a are expected to consist of approximately 4,284 single- and multi-family residential units, approximately three million square feet of commercial uses (retail, service, office, and related uses), three schools, and one fire station.

This future baseline condition is used as basis for comparing the Year 2031 plus Full Project (With Action) Conditions, in which 100 percent of Phase 2B of the River Islands Development is additionally assumed to be completed for the purposes of the EIS traffic and air quality analysis. The With Action scenario will identify potential long-term (cumulative) traffic impacts expected with full buildout of River Islands Phase 2B in Year 2031.

Area Development Assumptions

Based on the prior concurrence of SJCOG and City of Lathrop staff and due to current economic conditions, TJKM assumed that all development surrounding River Islands in the Lathrop planning areas and San Joaquin County as a whole, originally projected to be built out by 2025, would now occur in 2031 due to current economic conditions in the region. Development assumptions include full build of the West Lathrop, Mossdale Village, and Central Lathrop development planning areas in the vicinity of River Islands. Appendix D includes a list of developments in the Mossdale Village, West Lathrop, and Central Lathrop areas that are in proximity to the proposed River Islands Development, which are anticipated to be complete by Year 2031.

Roadway Network Assumptions

TJKM based the analysis of Year 2031 traffic conditions based on future local roadway network assumptions. Based on concurrence of SJCOG and City of Lathrop staff and due to current economic conditions, study area roadway improvements that were originally projected to be in place by 2025 based on the Lathrop Traffic Monitoring Program and the 2007 SJCOG Regional Transportation Plan (RTP) are now considered to be in place six years later (i.e., 2031). The following programmed and funded roadway improvements in the RTP that are located in the vicinity of the River Islands Development are expected to be in place by Year 2031:

- Interstate 205: Widening from six to eight lanes between I-5 and I-580
- Interstate 5: Widening from six to eight lanes between SR 120 and French Camp
- Interstate 5 (Mossdale): Widening from nine to 12 through lanes between SR 120 and I-205
- SR 120: Widening from four to six lanes (inside) between I-5 and SR 99.
- Reconstructed I-5 / Louise Avenue interchange that is a modified diamond with new westbound to southbound loop ramp
- Construction of new interchange at I-205 / Paradise Road / Chrisman Road

Turning movement volumes, traffic controls, and lane geometries anticipated for intersections both external and internal to the River Islands development for Year 2031 Baseline Conditions are shown in Figure 10 and Figure 11, respectively. The project model was executed for this baseline scenario given the above roadway improvements and River Islands and other area development expected to be in place by Year 2031. The intersection traffic controls and lane geometries are based on those anticipated in the River Islands SEIR, as well as the 2006 Lathrop Traffic Monitoring

Program (TMP) and subsequent TJKM traffic studies of internal River Islands intersections. For the Golden Valley Parkway / River Islands Parkway intersection and the two I-5 / Louise Avenue ramp intersections, TJKM developed buildout intersection geometries consistent with the I-5 / Louise Avenue Project Study Report (PSR) and anticipated retail commercial development in the vicinity that provide the basis for analysis.

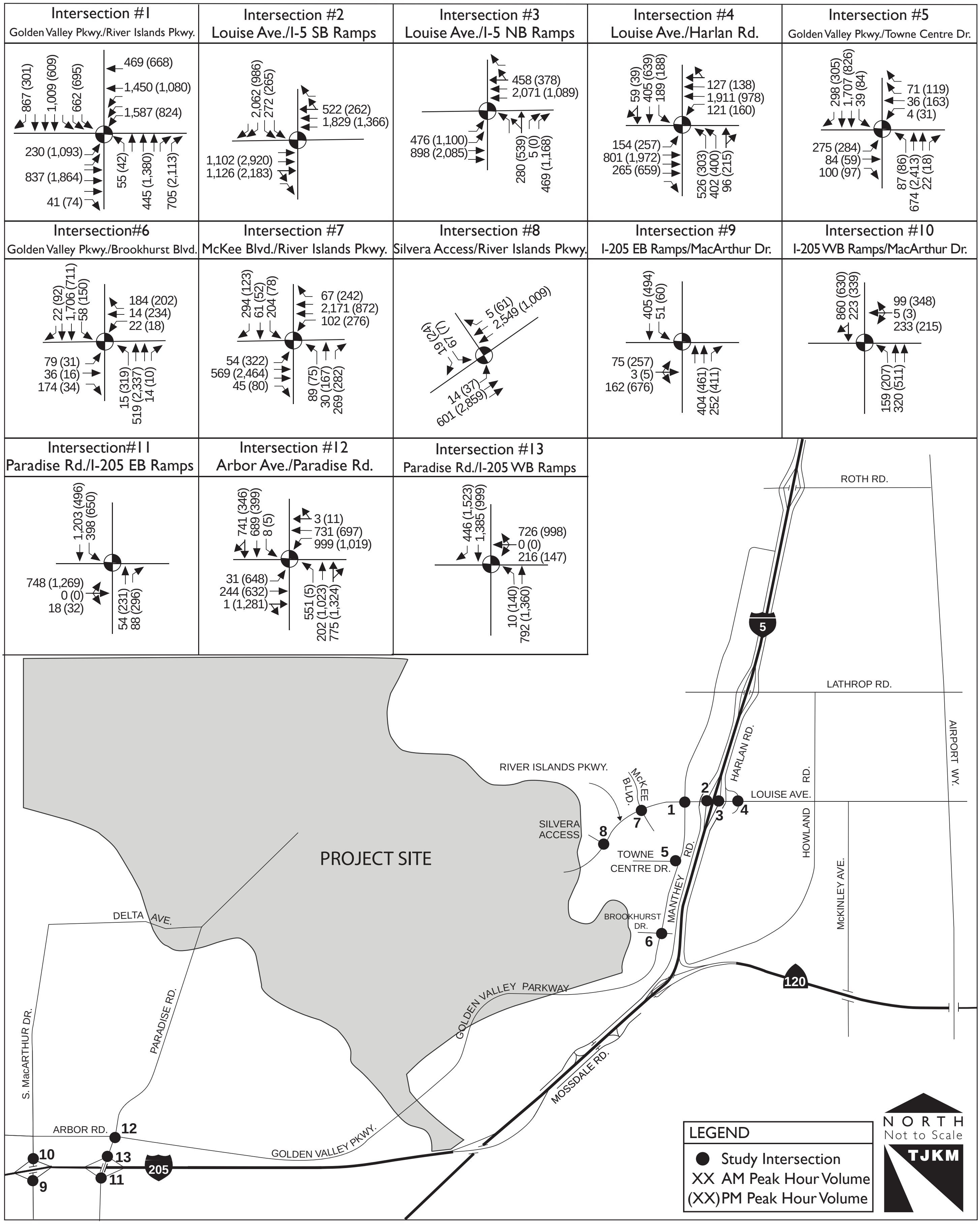
Intersection Level of Service Analysis Results (Year 2031 Baseline Conditions)
Table XV summarizes the results of the intersection LOS analysis for Year 2031 Baseline Conditions. Detailed calculation sheets are contained in Appendix H.

The following intersections are expected to operate unacceptably under this scenario:

- Golden Valley Parkway / River Islands Parkway (LOS E during the a.m. peak hour and LOS F during the p.m. peak hour)
- I-5 Southbound Ramps / Louise Avenue (LOS F during both peak hours)
- I-5 Northbound Ramps / Louise Avenue (LOS F during the p.m. peak hour)
- Harlan Road / Louise Avenue (LOS F during both peak hours)
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour)
- McKee Boulevard / River Islands Parkway (LOS E during the p.m. peak hour)
- MacArthur Drive / I-205 Eastbound Ramps (LOS F during the p.m. peak hour)
- MacArthur Drive / I-205 Westbound Ramps (LOS F during both peak hours)
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours)
- Paradise Road / Arbor Avenue (LOS F during both peak hours)
- Paradise Road / I-205 Westbound Ramps (LOS F during both peak hours)

2031 Baseline Conditions (External Intersections)

Figure 10



City of Lathrop - River Islands Phase 2 EIS

2031 Baseline Conditions (Internal Intersections)

Figure

11

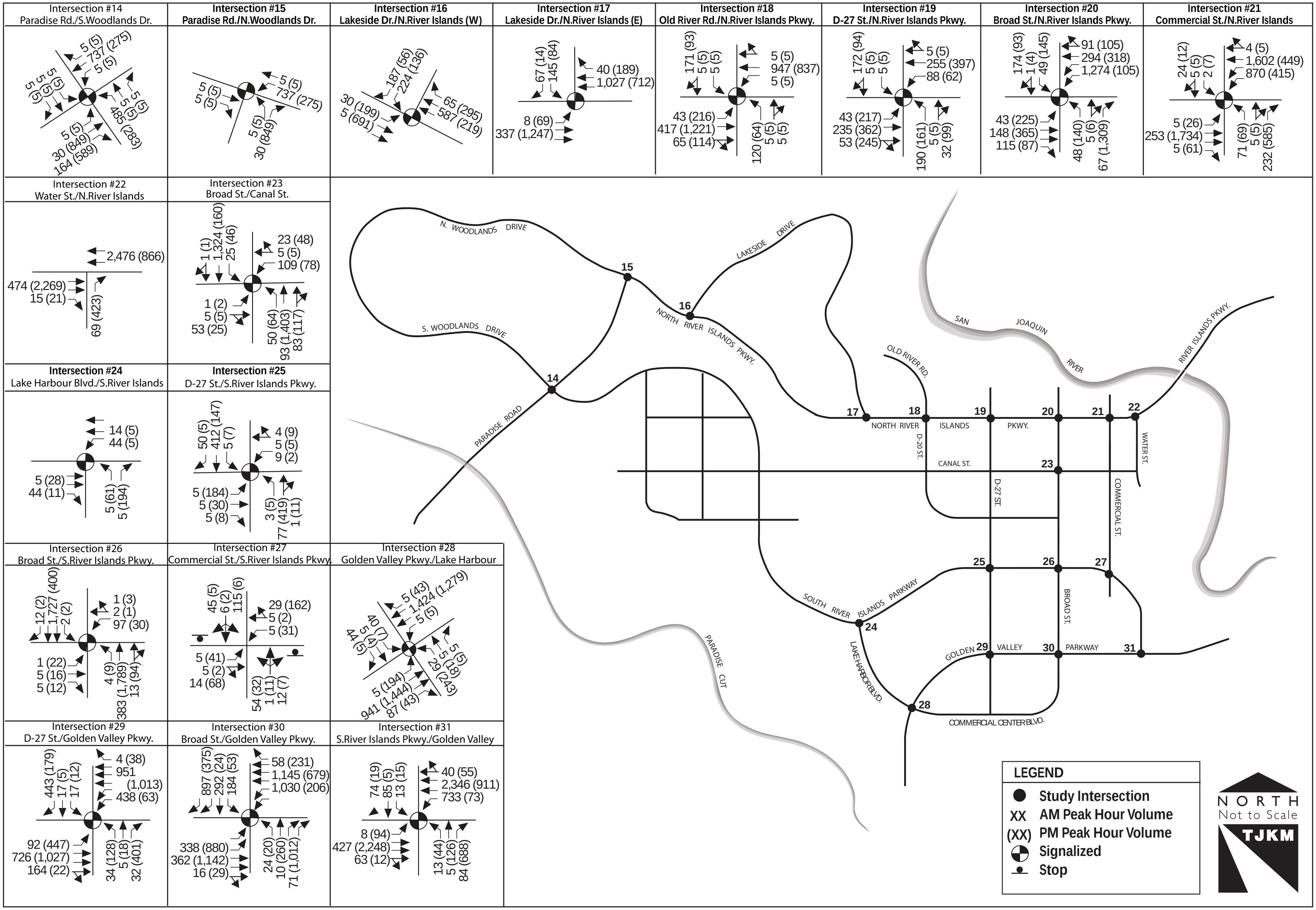


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Table XV: Intersection Levels of Service – Year 2031 Baseline Conditions

ID	***Intersection***	***Control***	***2031 Baseline Conditions***			
			A.M. Peak Hour		***P.M. Peak Hour***	
			Delay	***LOS***	***Delay***	***LOS***
1	Golden Valley Parkway/River Islands Parkway	Signal	59.0	**E**	120+	**F**
2	I-5 Southbound Ramps/Louise Avenue	Signal	108.7	**F**	110.6	**F**
3	I-5 Northbound Ramps/Louise Avenue	Signal	15.8	B	100.4	**F**
4	Harlan Road/Louise Avenue	Signal	92.3	**F**	90.6	**F**
5	Golden Valley Parkway/Towne Centre Drive	Signal	29.5	C	93.3	**F**
6	Golden Valley Parkway/Brookhurst Boulevard	Signal	13.0	B	47.4	D
7	McKee Boulevard/River Islands Parkway	Signal	26.2	C	72.5	**E**
8	Silvera Access/River Islands Parkway	Signal	4.6	A	6.3	A
9	MacArthur Drive/I-205 Eastbound Ramps	Signal	10.5	B	81.0	**F**
10	MacArthur Drive/I-205 Westbound Ramps	Signal	106.5	**F**	120+	**F**
11	Paradise Road/I-205 Eastbound Ramps	Signal	97.3	**F**	120+	**F**
12	Paradise Road/Arbor Avenue	Signal	120+	**F**	120+	**F**
13	Paradise Road/I-205 Westbound Ramps	Signal	120+	**F**	120+	**F**
14	Paradise Road/S. Woodlands Drive	Signal	17.0	B	15.7	B
15	Paradise Road/N. Woodlands Drive	Signal	3.2	A	28.0	C
16	Lakeside Drive/N. River Islands Parkway (W)	Signal	18.6	B	10.1	B
17	Lakeside Drive/N. River Islands Parkway (E)	Signal	7.8	A	4.8	A
18	Old River Road/N. River Islands Parkway	Signal	14.9	B	10.3	B
19	D-27 Street/N. River Islands Parkway	Signal	32.5	C	22.2	C
20	Broad Street/N. River Islands Parkway	Signal	13.5	B	24.1	C
21	Commercial Street/N. River Islands Parkway	Signal	13.2	B	21.8	C
22	Water Street/N. River Islands Parkway	Free	7.2	A	12.8	B
23	Broad Street/Canal Street	Signal	5.6	A	4.3	A
24	Lake Harbor Boulevard/S. River Islands Parkway	Signal	20.5	C	13.4	B
25	D-27 Street/S. River Islands Parkway	Signal	21.1	C	15.5	B
26	Broad Street/S. River Islands Parkway	Signal	8.1	A	7.4	A
27	Commercial Street/S. River Islands Parkway	Two-way Stop	9.6	A	10.6	B
28	Golden Valley Parkway/Lake Harbor Boulevard	Signal	8.0	A	17.0	B
29	D-27 Street/Golden Valley Parkway	Signal	30.9	C	29.5	C
30	Broad Street/Golden Valley Parkway	Signal	19.4	B	25.0	C
31	S. River Islands Parkway/Golden Valley Parkway	Signal	12.9	B	54.1	D

Notes: 1) LOS=Level of Service, Delay = Average control delay per vehicle
2) Signalized and four-way stop controlled intersections – Delay / LOS is for overall intersection
3) Unsignalized one- and two-way stop controlled intersections – Delay / LOS is for critical minor stop-controlled approach.
4) **Bold** indicates unacceptable operational conditions.

Roadway Level of Service Analysis (Year 2031 Baseline Conditions)

Table XVI below shows LOS for the study rural roadway segments under Year 2031 Baseline Conditions. Detailed LOS calculations are contained in Appendix H. The two segments on Paradise Road and one segment on Arbor Avenue (all of which are four-lane segments) are expected to operate acceptably at LOS C or better, which is within acceptable San Joaquin County operational standards. The two-lane segment of MacArthur Drive is expected to operate at LOS D or better, which is within acceptable City of Tracy operational standards.

Table XVI: Roadway Levels of Service – Year 2031 Baseline Conditions

ID	Segment	Direction	Number of Lanes	A.M. Peak Hour			P.M. Peak Hour		
				Volume	Density	LOS	Volume	Density	LOS
1	Paradise Rd. (Arbor Ave. to Paradise Cut)	NB	2	224	2.6	A	1,497	17.8	B
		SB	2	1,301	15.3	B	613	7.3	A
2	Paradise Rd. (Arbor Ave. to I-205)	NB	2	1,528	18.2	C	1,880	23.0	C
		SB	2	1,688	20.1	C	1,690	20.7	C
3	Arbor Ave. (Paradise Rd. to MacArthur Dr.)	EB	2	143	1.7	A	1,553	18.9	C
		WB	2	1,641	19.7	C	656	8.0	A
4	MacArthur Dr. (Arbor Ave. to I-205)	NB/SB	1	827	0.28 (v/c)	B	1,464	0.49 (v/c)	D

Notes: 1) HCM Multilane Highway Methodology used for all segments except segment #4 (MacArthur Drive), where two-lane rural highway HCM methodology was used. For segment #4, v/c ratio provides basis for LOS.
2) Density = passenger cars / mile / lane, V/C = volume to capacity ratio, LOS = Level of Service

Freeway Mainline Level of Service Analysis (Year 2031 Baseline Conditions)

Table XVII below shows LOS for the study freeway mainline sections Year 2031 Baseline Conditions. Detailed LOS calculations are contained in Appendix H. Under this scenario, the following freeway mainline segments are expected to operate unacceptably:

- I-5 north of Louise Avenue Interchange (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-5 between Louise Avenue and SR 120 (LOS E for the southbound a.m. peak hour)
- I-5 between SR 120 and Manthey/Mossdale Interchange (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-5 between Manthey/Mossdale Interchange and I-205 (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-205 between I-5 and Paradise Avenue Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- I-205 between Paradise Avenue and MacArthur Drive Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- I-205 west of MacArthur Drive (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- SR 120 east of I-5 (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)

Table XVII: Freeway Mainline Levels of Service – Year 2031 Baseline Conditions

ID	Segment	Direction	No. of Lanes	A.M. Peak Hour			P.M. Peak Hour		
				Volume	Density	LOS	Volume	Density	LOS
1	I-5 North of Louise Ave. Interchange	NB	4	4,388	18.6	C	8,955	>45	**F**
		SB	4	8,605	>45	**F**	5,943	23.4	C
2	I-5 Between Louise Ave & SR-120	NB	4	3,994	16.9	B	7,735	33.6	D
		SB	4	7,705	37.3	**E**	5,645	22.2	C
3	I-5 Between SR-120 & Manthey/Mossdale Hook Ramps	NB	6	5,427	15.3	B	14,131	>45	**F**
		SB	6	14,143	>45	**F**	7,669	20.0	C
4	I-5 Between Manthey/Mossdale Hook Ramps & I-205	NB	6	5,618	15.9	B	14,178	>45	**F**
		SB	6	13,149	>45	**F**	7,342	19.1	C
5	I-5 Just South of I-205	NB	3	2,515	14.2	B	5,724	32.8	C
		SB	3	4,516	25.3	C	3,949	20.6	C
6	I-205 Between I-5 & Paradise Ave. Interchange	EB	4	3,242	13.1	B	8,928	>45	**F**
		WB	4	8,773	>45	**F**	3,867	15.1	B
7	I-205 Between Paradise Ave. Interchange & MacArthur Dr. Interchange	EB	4	3,992	16.1	B	9,656	>45	**F**
		WB	4	9,548	>45	**F**	4,666	18.3	C
8	I-205 West of MacArthur Dr.	EB	4	3,859	15.6	B	10,154	>45	**F**
		WB	4	9,926	>45	**F**	5,002	19.6	C
9	SR-120 Just East of I-5	EB	3	1,713	10.1	A	6,970	>45	**F**
		WB	3	2,721	>45	**F**	2,597	13.4	B

Note: Density in passenger cars per mile per lane, LOS = Level of Service

Freeway Ramp Merge / Diverge Level of Service Analysis (Year 2031 Baseline Conditions)

Table XVIII shows the results of a freeway ramp merge / diverge LOS analysis of the study freeway on-ramps and off-ramps under Year 2031 Baseline Conditions. Detailed LOS calculations are contained in Appendix H. Under this scenario, the following diverge and merge locations are expected to operate unacceptably:

- I-5 / Louise Avenue Northbound Off-Ramp (LOS F during p.m. peak hour)
- I-5 / Louise Avenue Northbound On-Ramp (LOS F during p.m. peak hour)
- I-5 / Louise Avenue Southbound Off-Ramp (LOS F during a.m. peak hour)
- I-5 / Louise Avenue Southbound On-Ramp (LOS F during both peak hours)
- I-5 / Manthey Road Southbound Off-Ramp (LOS F during a.m. peak hour)
- I-5 / Manthey Road Southbound On-Ramp (LOS F during a.m. peak hour)
- I-5 / Mossdale Road Northbound Off-Ramp (LOS F during p.m. peak hour)
- I-5 / Mossdale Road Northbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Eastbound Off-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Eastbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Westbound Off-Ramp (LOS F during a.m. peak hour)
- I-205 / MacArthur Drive Westbound On-Ramp (LOS F during a.m. peak hour)

- I-205 / Paradise Road Eastbound Off-Ramp (LOS F during p.m. peak hour)
- I-205 / Paradise Road Eastbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / Paradise Road Westbound Off-Ramp (LOS F during a.m. peak hour)
- I-205 / Paradise Road Westbound On-Ramp (LOS F during a.m. peak hour)

Table XVIII: Freeway Ramp Levels of Service – Year 2031 Baseline Conditions

ID	*Interchange*	*Ramp*	*Condition*	*Ramp Lanes*	*Freeway Lanes*	*A.M. Peak Hour LOS*	*P.M. Peak Hour LOS*
1	I-5/Louise Ave.	NB Off	Diverge	2	4	C	**F**
		NB On	Merge	2	4	C	**F**
		SB Off	Diverge	2	4	**F**	D
		SB On	Merge	2	4	**F**	**F**
2	I-5/Manthey Rd.	SB Off	Diverge	1	6	**F**	D
		SB On	Merge	1	6	**F**	C
3	I-5/Mossdale Rd.	NB Off	Diverge	1	6	C	**F**
		NB On	Merge	1	6	C	**F**
4	I-205/MacArthur Dr.	EB Off	Diverge	1	4	C	**F**
		EB On	Merge	1	4	C	**F**
		WB Off	Diverge	1	4	**F**	C
		WB On	Merge	1	4	**F**	C
5	I-205/Paradise Rd.	EB Off	Diverge	1	4	C	**F**
		EB On	Merge	1	4	C	**F**
		WB Off	Diverge	1	4	**F**	C
		WB On	Merge	1	4	**F**	D

Note: Density in passenger cars per mile per lane, LOS = Level of Service

Year 2031 With Action Conditions

This Scenario is similar to Year 2031 Baseline Conditions, but with the addition of traffic generated the entire Phase 2B of the River Islands Development. The assumed roadway network and nearby area development is assumed to be the same under this traffic scenario as for Year 2031 Baseline Conditions.

Project Land Uses and Site Access / Circulation

For the purposes of the EIS traffic analysis, it is assumed under this scenario that 100 percent of Phase 2B of the River Islands Development is built. Under full Phase 2B completion in Year 2031, it is estimated that 6,720 residential units would be built (3,871 single-family and 2,849 multi-family), along with approximately 2,000,000 square feet of commercial development. Table XIX shows the estimated land use totals within River Islands assumed in the project travel demand model under this scenario. The totals include both the baseline Phase 1 / 2A and full build Phase 2B (With Action) development land uses. The neighborhoods listed are shown in Figure 2. Appendix F contains detailed information for each traffic analysis zone (TAZ) representing Year 2031 River Islands Development land use in the model, including residential units and commercial jobs.

In terms of River Islands Development site access and circulation, the assumptions are the same as those detailed under Year 2031 With Action Conditions.

Table XIX: River Islands Development Assumptions (Year 2031 With Action Conditions)

Development Phase	***Neighborhood***	***Residential Units***		***Commercial Area (KSF)***		
		SF	***MF***	***Retail***	***Service***	***Other***
Phase 1 / 2A (2031 Baseline Condition)	East Village	2,103	203	0	0	0
	Employment Center	0	0	161	920	1,539
	Lakeside	1,000	0	0	0	0
	Town Center	636	344	213	118	48
	Phase 1 / 2A Total	**3,739**	**547**	**374**	**1,038**	**1,588**
Phase 2B (2031 With Action Condition)	Employment Center	0	0	135	768	982
	Lake Harbor	300	200	0	0	0
	Old River Road	700	200	0	0	0
	West Village	1,350	1,350	57	32	25
	Woodlands	1,521	1,099	0	0	0
	Phase 2B Total	**3,871**	**2,849**	**192**	**800**	**1,007**
Overall Totals		**7,610**	**3,396**	**566**	**1,839**	**2,595**

Notes: 1) SF = single-family residential, MF = multi-family residential; KSF = 1,000 square feet
2) Commercial square footage based proportionally on projected jobs by neighborhood (see Appendix F) and approximately 3 million square feet (sq. ft.) of Phase 1 / 2A commercial development and 2 million sq. ft. of Phase 2B full build commercial development.

Project Trips
Project traffic for the full build Phase 2B development was generated by the model and was added to the Year 2031 Baseline volumes to generate volumes for Year 2031 With Action Conditions. Turning movement volumes, traffic controls, and lane geometries anticipated for intersections both external and internal to the River Islands development for Year 2031 With Action Conditions are shown in Figure 12 and Figure 13, respectively. The intersection traffic controls and lane geometries assumed are the same as under the Year 2031 Baseline scenario.

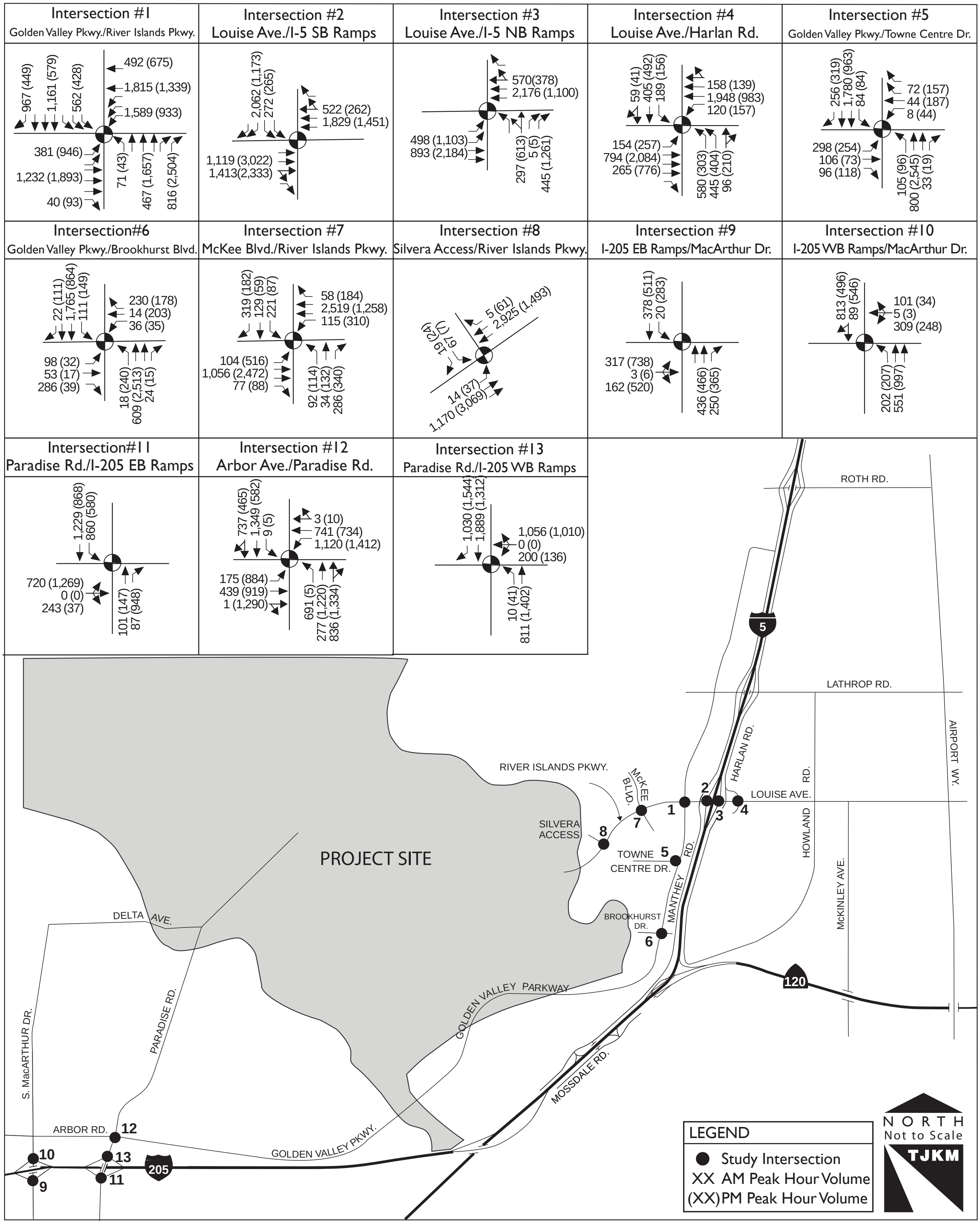
Appendix F additionally includes an estimation of Year 2031 trip rates contained in the model for each River Islands land use type, both without and with completion of the full build Phase 2B. Also included are vehicle miles traveled (VMT) estimates, both overall and by trip purpose (home-based work, home-based other, etc.).

Intersection Level of Service Analysis Results (Year 2031 With Action Conditions)
The LOS analysis results for both Year 2031 Baseline and Year 2031 plus Phase 2B Project Conditions are summarized in Table XX. Detailed calculations are contained in Appendix I.

City of Lathrop - River Islands Phase 2 EIS

Figure 12

2031 With Action Conditions (External Intersections)



City of Lathrop - River Islands Phase 2 EIS

2031 With Action Conditions (Internal Intersections)

Figure 13

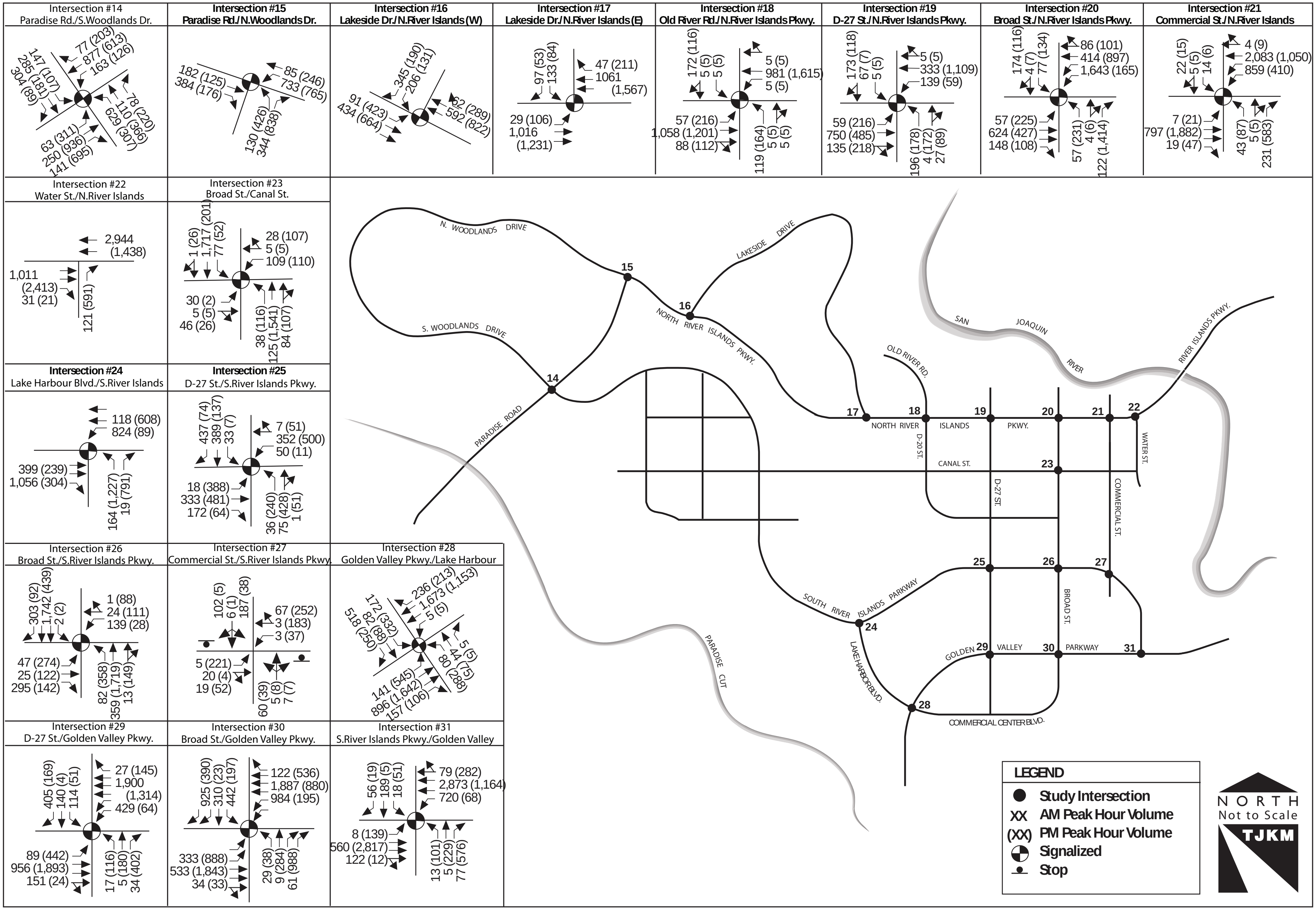


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Table XX: Intersection Levels of Service – Year 2031 With Action Conditions

ID	Intersection	Control	*2031 Baseline Conditions*				*2031 With Action Conditions*			
			A.M. Peak Hour		*P.M. Peak Hour*		*A.M. Peak Hour*		*P.M. Peak Hour*	
			Delay	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*
1	Golden Valley Parkway / River Islands Parkway	Signal	59.0	**E**	120+	**F**	109.2	**F** *	120+	**F** *
2	I-5 Southbound Ramps / Louise Avenue	Signal	108.7	**F**	110.6	**F**	120+	**F** *	120+	**F** *
3	I-5 Northbound Ramps / Louise Avenue	Signal	15.8	B	100.4	**F**	17.0	B	116.7	**F** *
4	Harlan Road / Louise Avenue	Signal	92.3	**F**	90.6	**F**	107.7	**F**	95.4	**F**
5	Golden Valley Parkway / Towne Centre Drive	Signal	29.5	C	93.3	**F**	30.2	C	107.0	**F**
6	Golden Valley Parkway / Brookhurst Boulevard	Signal	13.0	B	47.4	D	17.0	B	54.5	D
7	McKee Boulevard / River Islands Parkway	Signal	26.2	C	72.5	**E**	54.7	D	69.7	**E**
8	Silvera Access / River Islands Parkway	Signal	4.6	A	6.3	A	8.3	A	11.8	B
9	MacArthur Drive / I-205 Eastbound Ramps	Signal	10.5	B	81.0	**F**	18.7	B	120+	**F**
10	MacArthur Drive / I-205 Westbound Ramps	Signal	106.5	**F**	120+	**F**	39.5	D	58.3	**E**
11	Paradise Road / I-205 Eastbound Ramps	Signal	97.3	**F**	120+	**F**	120+	**F**	120+	**F**
12	Paradise Road / Arbor Avenue	Signal	120+	**F**	120+	**F**	120+	**F**	120+	**F**
13	Paradise Road / I-205 Westbound Ramps	Signal	120+	**F**	120+	**F**	120+	**F**	120+	**F**
14	Paradise Road / S. Woodlands Drive	Signal	17.0	B	15.7	B	37.1	D	51.1	D
15	Paradise Road / N. Woodlands Drive	Signal	3.2	A	28.0	C	20.9	C	19.8	B
16	Lakeside Drive / N. River Islands Parkway (W)	Signal	18.6	B	10.1	B	16.1	B	23.0	C
17	Lakeside Drive / N. River Islands Parkway (E)	Signal	7.8	A	4.8	A	8.2	A	7.9	A
18	Old River Road / N. River Islands Parkway	Signal	14.9	B	10.3	B	14.3	B	22.6	C
19	D-27 Street / N. River Islands Parkway	Signal	32.5	C	22.2	C	25.7	C	11.7	B
20	Broad Street / N. River Islands Parkway	Signal	13.5	B	24.1	C	28.2	C	42.7	D
21	Commercial Street / N. River Islands Parkway	Signal	13.2	B	21.8	C	15.3	B	27.1	C
22	Water Street / N. River Islands Parkway	Free	7.2	A	12.8	B	7.8	A	22.3	C
23	Broad Street / Canal Street	Signal	5.6	A	4.3	A	5.3	A	7.3	A
24	Lake Harbor Boulevard / S. River Islands Parkway	Signal	20.5	C	13.4	B	51.9	D	29.7	C
25	D-27 Street / S. River Islands Parkway	Signal	21.1	C	15.5	B	25.9	C	52.9	D
26	Broad Street / S. River Islands Parkway	Signal	8.1	A	7.4	A	54.1	D	40.1	D

Table continued next page.

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ID	Intersection	Control	2031 Baseline Conditions				2031 With Action Conditions			
			A.M. Peak Hour		P.M. Peak Hour		A.M. Peak Hour		P.M. Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
27	Commercial Street / S. River Islands Parkway	Two-way Stop	9.6	A	10.6	B	10.8	B	24.8	C
28	Golden Valley Parkway / Lake Harbor Boulevard	Signal	8.0	A	17.0	B	42.9	D	38.6	D
29	D-27 Street / Golden Valley Parkway	Signal	30.9	C	29.5	C	19.3	B	32.0	C
30	Broad Street / Golden Valley Parkway	Signal	19.4	B	25.0	C	28.8	C	47.6	D
31	S. River Islands Parkway / Golden Valley Parkway	Signal	12.9	B	54.1	D	20.4	C	51.5	D

Notes: 1) LOS=Level of Service, Delay = Average control delay per vehicle
2) Signalized and four-way stop controlled intersections – Delay / LOS is for overall intersection
3) Unsignalized one- and two-way stop controlled intersections – Delay / LOS is for critical minor stop-controlled approach.
4) **Bold** indicates unacceptable operational conditions.
* Assumed geometry is buildout and cannot be physically expanded further. Impacts/mitigations discussed in next section.

The following intersections are expected to operate unacceptably under this scenario:

- Golden Valley Parkway / River Islands Parkway (LOS F during both peak hours)
- I-5 Southbound Ramps / Louise Avenue (LOS F during both peak hours)
- I-5 Northbound Ramps / Louise Avenue (LOS F during the p.m. peak hour)
- Harlan Road / Louise Avenue (LOS F during both peak hours)
- Golden Valley Parkway / Towne Centre Drive (LOS F during the p.m. peak hour)
- McKee Boulevard / River Islands Parkway (LOS E during the p.m. peak hour)
- MacArthur Drive / I-205 Eastbound Ramps (LOS F during the p.m. peak hour)
- MacArthur Drive / I-205 Westbound Ramps (LOS E during the p.m. peak hour)
- Paradise Road / I-205 Eastbound Ramps (LOS F during both peak hours)
- Paradise Road / Arbor Avenue (LOS F during both peak hours)
- Paradise Road / I-205 Westbound Ramps (LOS F during both peak hours)

Roadway Level of Service Analysis (Year 2031 With Action Conditions)

Table XXI below shows LOS for the study rural roadway segments under Year 2031 With Action Conditions. Detailed LOS calculations are contained in Appendix I. All study roadway segments are expected to operate acceptably with the exception of Paradise Road between Arbor Avenue and I-205, which is expected to operate at LOS D in the southbound direction during the a.m. peak hour and northbound direction during the p.m. peak hour. These service levels on Paradise Road exceed acceptable San Joaquin County operational standards of LOS C or better.

Table XXI: Roadway Levels of Service – Year 2031 With Action Conditions

ID	Segment	Direction	Number of Lanes	A.M. Peak Hour			P.M. Peak Hour		
				Volume	Density	LOS	Volume	Density	LOS
1	Paradise Rd. (Arbor Ave. to Paradise Cut)	NB	2	454	5.3	A	2,112	25.1	C
		SB	2	1,955	23.0	C	1,052	12.5	B
2	Paradise Rd. (Arbor Ave. to I-205)	NB	2	1,804	21.4	C	2,219	27.2	D
		SB	2	2,469	29.4	D	1,994	24.4	C
3	Arbor Ave. (Paradise Rd. to MacArthur Dr.)	EB	2	614	7.4	A	1,802	22.0	C
		WB	2	1,880	22.6	C	910	11.1	B
4	MacArthur Dr. (Arbor Ave. to I-205)	NB/SB	1	1,476	0.49 (v/c)	D	2,012	0.67 (v/c)	D

Notes: 1) HCM Multilane Highway Methodology used for all segments except segment #4 (MacArthur Drive), where two-lane rural highway HCM methodology was used. For segment #4, v/c ratio provides basis for LOS.
2) Density = passenger cars / mile / lane, V/C = volume to capacity ratio, LOS = Level of Service
3) **Bold** indicates unacceptable operational service levels.

Freeway Mainline Level of Service Analysis (Year 2031 With Action Conditions)

Table XII below shows LOS for the study freeway mainline sections under Year 2031 With Action Conditions. Detailed LOS calculations are contained in Appendix I. Under this scenario, the following freeway mainline segments are expected to operate unacceptably:

- I-5 north of Louise Avenue Interchange (LOS F for the northbound p.m. peak hour and LOS E for the southbound a.m. peak hour)
- I-5 between SR 120 and Manthey/Mossdale Interchange (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-5 between Manthey/Mossdale Interchange and I-205 (LOS F for the northbound p.m. peak hour and southbound a.m. peak hour)
- I-5 south of I-205 (LOS E for the northbound p.m. peak hour)
- I-205 between I-5 and Paradise Avenue Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- I-205 between Paradise Avenue and MacArthur Drive Interchanges (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- I-205 west of MacArthur Drive (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)
- SR 120 east of I-5 (LOS F for the eastbound p.m. peak hour and westbound a.m. peak hour)

Table XXII: Freeway Mainline Levels of Service – Year 2031 With Action Conditions

ID	Segment	Direction	No. of Lanes	A.M. Peak Hour			P.M. Peak Hour		
				Volume	Density	LOS	Volume	Density	LOS
1	I-5 North of Louise Ave. Interchange	NB	4	4,478	19.0	C	8,944	>45	F
		SB	4	8,290	44.4	E	6,306	25.1	C
2	I-5 Between Louise Ave & SR-120	NB	4	3,929	16.6	B	7,882	34.8	D
		SB	4	7,415	34.6	D	5,995	23.7	C
3	I-5 Between SR-120 & Manthey/Mossdale Hook Ramps	NB	6	5,359	15.1	B	14,096	>45	F
		SB	6	14,267	>45	F	7,777	20.3	C
4	I-5 Between Manthey/Mossdale Hook Ramps & I-205	NB	6	5,554	15.7	B	14,397	>45	F
		SB	6	13,166	>45	F	7,516	19.6	C
5	I-5 Just South of I-205	NB	3	2,612	14.7	B	6,171	38.0	E
		SB	3	4,711	26.7	D	4,329	22.7	C
6	I-205 Between I-5 & Paradise Ave. Interchange	EB	4	3,259	13.2	B	8,977	>45	F
		WB	4	8,772	>45	F	3,938	15.4	B
7	I-205 Between Paradise Ave. Interchange & MacArthur Dr. Interchange	EB	4	3,802	15.4	B	9,366	>45	F
		WB	4	9,695	>45	F	4,757	18.6	C
8	I-205 West of MacArthur Dr.	EB	4	3,966	16.0	B	10,020	>45	F
		WB	4	10,345	>45	F	5,078	19.9	C
9	SR-120 Just East of I-5	EB	3	1,668	9.9	A	7,035	>45	F
		WB	3	7,090	>45	F	2,603	13.5	B

Note: Density in passenger cars per mile per lane, LOS = Level of Service

Freeway Ramp Merge / Diverge Level of Service Analysis (Year 2031 With Action Conditions)

Table XXIII shows the results of a freeway ramp merge / diverge LOS analysis of the study freeway on-ramps and off-ramps under Year 2031 With Action Conditions. Detailed LOS calculations are contained in Appendix I. Under this scenario, the following freeway ramp merge / diverge locations are expected to operate unacceptably:

- I-5 / Louise Avenue Northbound Off-Ramp (LOS F during p.m. peak hour)
- I-5 / Louise Avenue Northbound On-Ramp (LOS F during p.m. peak hour)
- I-5 / Louise Avenue Southbound Off-Ramp (LOS F during both peak hours)
- I-5 / Louise Avenue Southbound On-Ramp (LOS F during both peak hours)
- I-5 / Manthey Road Southbound Off-Ramp (LOS F during a.m. peak hour)
- I-5 / Manthey Road Southbound On-Ramp (LOS F during a.m. peak hour)
- I-5 / Mossdale Road Northbound Off-Ramp (LOS F during p.m. peak hour)
- I-5 / Mossdale Road Northbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Eastbound Off-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Eastbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / MacArthur Drive Westbound Off-Ramp (LOS F during a.m. peak hour)
- I-205 / MacArthur Drive Westbound On-Ramp (LOS F during a.m. peak hour)

- I-205 / Paradise Road Eastbound Off-Ramp (LOS F during p.m. peak hour)
- I-205 / Paradise Road Eastbound On-Ramp (LOS F during p.m. peak hour)
- I-205 / Paradise Road Westbound Off-Ramp (LOS F during a.m. peak hour)
- I-205 / Paradise Road Westbound On-Ramp (LOS F during a.m. peak hour)

Table XXIII: Freeway Ramp Levels of Service – Year 2031 With Action Conditions

ID	*Interchange*	*Ramp*	*Condition*	*Ramp Lanes*	*Freeway Lanes*	*Year 2031 Baseline Conditions*		*Year 2031 With Action Conditions*	
						A.M. Peak Hour LOS	*P.M. Peak Hour LOS*	*A.M. Peak Hour LOS*	*P.M. Peak Hour LOS*
1	I-5/ Louise Ave.	NB Off	Diverge	1	3	C	F	C	F
		NB On	Merge	1	3	C	F	C	F
		SB Off	Diverge	1	3	F	D	F	F
		SB On	Merge	1	3	F	F	F	F
2	I-5/ Manthey Rd.	SB Off	Diverge	1	5	F	D	F	D
		SB On	Merge	1	5	F	C	F	C
3	I-5/ Mossdale Rd.	NB Off	Diverge	1	5	C	F	C	F
		NB On	Merge	1	4	C	F	C	F
4	I-205/ MacArthur Dr.	EB Off	Diverge	1	3	C	F	C	F
		EB On	Merge	1	3	C	F	C	F
		WB Off	Diverge	1	3	F	C	F	C
		WB On	Merge	1	3	F	C	F	C
5	I-205/ Paradise Rd.	EB Off	Diverge	1	4	C	F	C	F
		EB On	Merge	1	4	C	F	C	F
		WB Off	Diverge	1	4	F	C	F	D
		WB On	Merge	1	4	F	D	F	D

Note: LOS = Level of Service

Significant Impacts and Mitigation Measures (Year 2031 With Action Conditions)
Based on the standards of significance, the full build of River Islands Phase 2B would have a significant impact on several intersections, roadway segments, and freeway facilities. Significant impacts and potential mitigation measures for all facilities are discussed below.

Intersections

Expected significant impacts at study intersections and potential mitigation measures are as follows:

- Golden Valley Parkway / River Islands Parkway – the full build of River Islands Phase 2B would cause a significant impact at this intersection based on City of Lathrop standards of significance, since it would worsen a.m. peak hour operations from LOS E to F and also worsen the baseline LOS F during the p.m. peak hour by increasing intersection traffic from the baseline by one percent or more.
    - *Mitigation:* The baseline traffic controls and lane geometry at this intersection represent buildout conditions due to anticipated buildout commercial development immediately adjacent to this intersection. Since it is physically and potentially financially infeasible to expand this intersection to mitigate service levels, alternative

mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this is a significant and unavoidable impact.

- I-5 Southbound Ramps / Louise Avenue – the full build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans and City of Lathrop standards of significance, since it would worsen a.m. and p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation:* The baseline traffic controls and lane geometry at this intersection represent buildout conditions due to anticipated buildout commercial development immediately adjacent to this intersection. Since it is physically and potentially financially infeasible to expand this intersection to mitigate service levels, alternative mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this is a significant and unavoidable impact.
- I-5 Northbound Ramps / Louise Avenue – the full build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans and City of Lathrop standards of significance, since it would worsen p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation:* The baseline traffic controls and lane geometry at this intersection represent buildout conditions due to anticipated buildout commercial development immediately adjacent to this intersection. Since it is physically and potentially financially infeasible to expand this intersection to mitigate service levels, alternative mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this is a significant and unavoidable impact.
- Harlan Road / Louise Avenue – the full build of River Islands Phase 2B would cause a significant impact at this intersection based on City of Lathrop standards of significance, since it would worsen a.m. and p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation:* Add one eastbound left turn lane, one northbound through lane, one westbound right turn lane, and one southbound right turn lane. This mitigation would result in LOS D during both the a.m. and p.m. peak hour, which is within acceptable City of Lathrop standards. Therefore, this impact would be mitigated to a less than significant level.
- Golden Valley Parkway / Towne Centre Drive – the full build of River Islands Phase 2B would cause a significant impact at this intersection based on City of Lathrop standards of significance, since it would worsen p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
  - *Mitigation:* Convert the northbound right turn lane to shared through/right turn lane. This mitigation would result in LOS C during both the a.m. and p.m. peak hours, which is within acceptable City of Lathrop standards. Therefore, this impact would be mitigated to a less than significant level.

- McKee Boulevard / River Islands Parkway - the full build of River Islands Phase 2B would cause a significant impact at this intersection based on City of Lathrop standards of significance, since it would worsen p.m. peak hour operations already at LOS E by increasing intersection traffic from the baseline by one percent or more.
    - *Mitigation:* Convert the eastbound right turn lane to shared through/right turn lane. This mitigation would result in LOS D during the a.m. peak hour and LOS C during the p.m. peak hour, which is within acceptable City of Lathrop standards. Therefore, this impact would be mitigated to a less than significant level.
- MacArthur Drive / I-205 Eastbound Ramps – the full build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans and City of Tracy standards of significance, since it would worsen p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
    - *Mitigation:* Add one eastbound left turn lane. This mitigation would result in LOS D during the p.m. peak hour, which is within acceptable Caltrans and City of Tracy standards. Therefore, this impact would be mitigated to a less than significant level.
- MacArthur Drive / I-205 Westbound Ramps - the full build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans and City of Tracy standards of significance, since it would worsen p.m. peak hour operations to LOS E.
    - *Mitigation:* Add one southbound right turn lane and restripe the southbound shared through/right lane to through lane. This mitigation would result in LOS C during the a.m. peak hour and LOS B during the p.m. peak hour, which is within acceptable Caltrans and City of Tracy standards. Therefore, this impact would be mitigated to a less than significant level.
- Paradise Road / I-205 Eastbound Ramps - the full build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans standards of significance, since it would worsen both a.m. and p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
    - *Mitigation:* Add one eastbound left turn lane, add one southbound through lane, add one northbound through lane, and make the northbound right turn a free movement. This mitigation would result in LOS D during both a.m. and p.m. peak hours, which is within acceptable Caltrans standards. Therefore, this impact would be mitigated to a less than significant level.
- Paradise Road / Arbor Avenue - the full build of River Islands Phase 2B would cause a significant impact at this intersection based on San Joaquin County standards of significance, since it would worsen both a.m. and p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
    - *Mitigation:* Add one eastbound left turn lane and one eastbound free right turn lane; add two westbound left turn lanes and one westbound right turn lane; add two northbound left turn lanes, one northbound through lane, and two northbound right turn lanes with overlap; add one southbound through lane and two southbound right turn lanes. This mitigation would result in LOS D during both a.m. and p.m. peak hours, which would still exceed San Joaquin County operational standards of LOS C or better. Since it is potentially physically and financially infeasible to further expand this intersection to mitigate service levels, alternative mitigation measures to mitigate project impacts, such as transportation demand management (TDM) measures may be implemented. While TDM measures have the potential to mitigate project impacts, they may not mitigate impacts to less than significant levels. Therefore, this is a significant and unavoidable impact.

- Paradise Road / I-205 Westbound Ramps – the full build of River Islands Phase 2B would cause a significant impact at this intersection based on Caltrans standards of significance, since it would worsen both a.m. and p.m. peak hour operations already at LOS F by increasing intersection traffic from the baseline by one percent or more.
    - *Mitigation:* Add one westbound right turn lane, one northbound through lane, and one southbound through lane, and make the southbound right turn a free movement. This mitigation would result in LOS D during both a.m. and p.m. peak hours, which is within acceptable Caltrans standards. Therefore, this impact would be mitigated to a less than significant level.

Table XXIV provides a summary of the resulting mitigated LOS for impacted study intersections under Year 2031 With Action Conditions. Detailed analysis sheets are included in Appendix I. Figure 14 illustrates the proposed intersection mitigations under this scenario.

Table XXIV: Mitigated Intersection Levels of Service – Year 2031 With Action Conditions

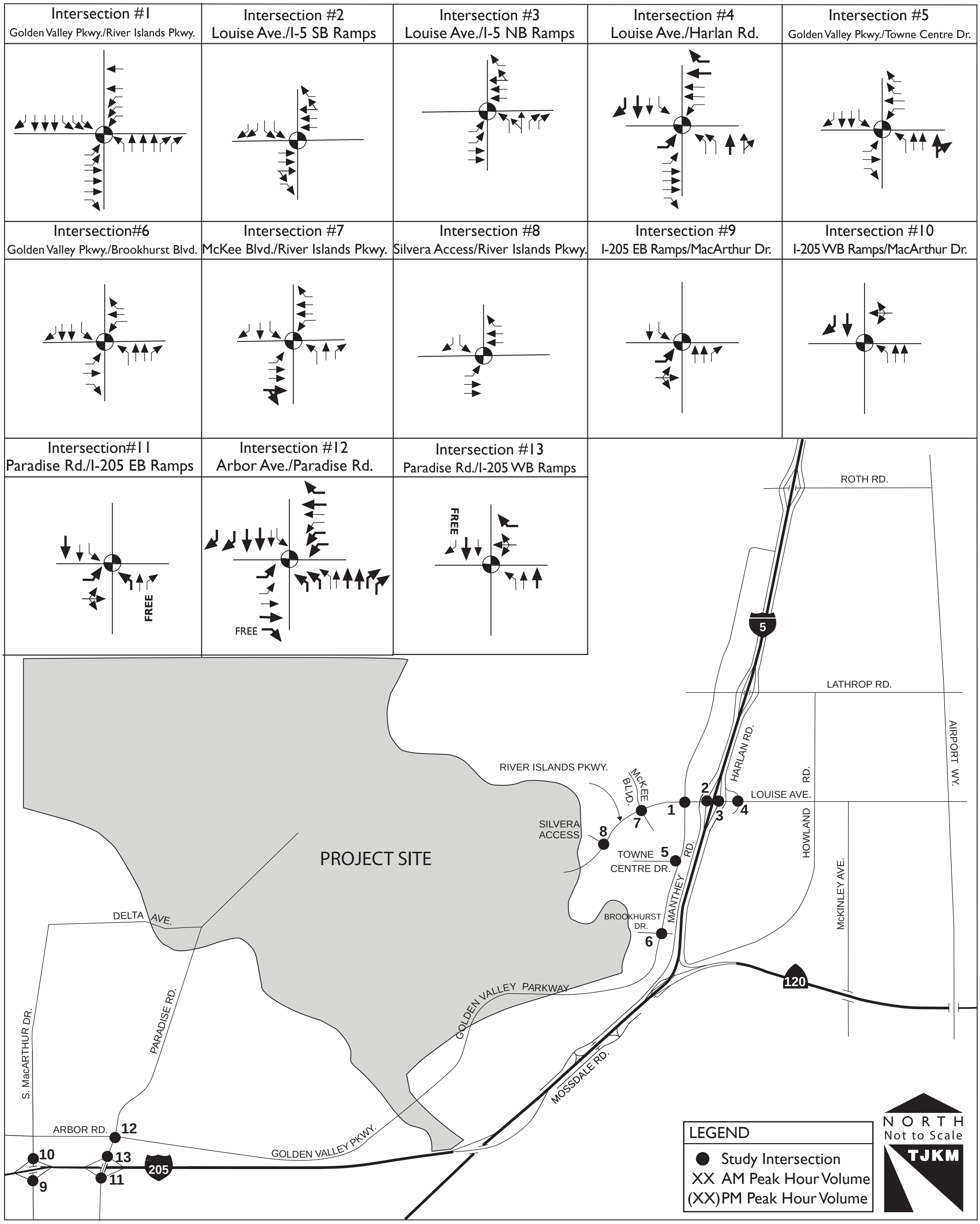
ID	Intersection	Control	Mitigated 2031 With Action Conditions			
			A.M. Peak Hour		P.M. Peak Hour	
			Delay	LOS	Delay	LOS
1	Golden Valley Parkway/River Islands Parkway	Signal	109.2	**F** *	190.1	**F** *
2	I-5 Southbound Ramps/Louise Avenue	Signal	128.1	**F** *	154.0	**F** *
3	I-5 Northbound Ramps/Louise Avenue	Signal	17.0	B	116.7	**F** *
4	Harlan Road/Louise Avenue	Signal	54.5	D	54.0	D
5	Golden Valley Parkway/Towne Centre Drive	Signal	29.4	C	33.3	C
7	McKee Boulevard/River Islands Parkway	Signal	54.5	D	32.7	C
9	MacArthur Drive/I-205 Eastbound Ramps	Signal	11.9	B	40.2	D
10	MacArthur Drive/I-205 Westbound Ramps	Signal	27.7	C	18.3	B
11	Paradise Road/I-205 Eastbound Ramps	Signal	39.8	D	37.1	D
12	Paradise Road/Arbor Avenue	Signal	54.7	D	43.4	D
13	Paradise Road/I-205 Westbound Ramps	Signal	40.9	D	41.4	D

Notes: 1) LOS=Level of Service, Delay = Average control delay per vehicle
2) Signalized intersections – Delay / LOS is for overall intersection
3) **Bold** indicates unacceptable operational conditions.
* Assumed geometry is buildout and cannot be physically expanded further. Alternative mitigations such as transportation demand management (TDM) measures are recommended, but such measures may still result in significant and unavoidable impacts.

City of Lathrop - River Islands Phase 2 EIS

2031 With Action Conditions (External Intersections) - Proposed Mitigations

Figure 14



Roadways

Expected significant impacts at study roadway segments and potential mitigation measures are as follows:

- Paradise Road (Arbor Avenue to I-205) - the full build of River Islands Phase 2B would cause a significant impact on this roadway segment based on San Joaquin County standards of significance, since it would worsen southbound a.m. peak hour and northbound p.m. peak hour operations from LOS C to D.
    - *Mitigation:* Widen the roadway segment from two to three lanes in both directions (from four- to six-lane roadway). This mitigation would result in LOS C or better during both peak hours and in both directions, which is within acceptable San Joaquin County operational standards. However, this mitigation is not programmed or funded. Therefore, this impact would remain significant and unavoidable.

Table XXV provides a summary of the resulting mitigated LOS for impacted the roadway segment under Year 2031 With Action Conditions. Detailed analysis sheets are included in Appendix I.

Table XXV: Mitigated Roadway Levels of Service – Year 2031 With Action Conditions

ID	Segment	Direction	Number of Lanes (Mitigated)	A.M. Peak Hour			P.M. Peak Hour		
				Volume	Density	LOS	Volume	Density	LOS
2	Paradise Rd. (Arbor Ave. to I-205)	NB	3	1,804	14.3	B	2,219	18.1	C
		SB	3	2,469	19.6	C	1,994	16.3	B

Note: Density in passenger cars per mile per lane, LOS = Level of Service

Freeway Mainline Segments

Expected significant impacts at study freeway mainline segments and potential mitigation measures are as follows:

- I-5 north of Louise Avenue Interchange - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since it would worsen northbound p.m. peak hour operations already at LOS F and southbound a.m. peak hour operations at LOS E.
    - *Mitigation:* Widen the freeway mainline from four to five lanes in both directions. This mitigation would result in LOS D or better during both peak hours and in both directions, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact is considered significant and unavoidable.
- I-5 between SR 120 and Manthey/Mossdale Interchange - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since it would worsen northbound p.m. peak hour and southbound a.m. peak hour operations already at LOS F.
    - *Mitigation:* Widen the freeway mainline from six to eight lanes in both directions. This mitigation would result in LOS D or better during both peak hours and in both directions, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Also, it is subject to physical feasibility since the resulting 16-lane freeway would effectively eliminate the Manthey Road / Mossdale Road hook ramps. Therefore, this impact is considered significant and unavoidable.

- I-5 between Manthey/Mossdale Interchange and I-205 - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since it would worsen northbound p.m. peak hour and southbound a.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the freeway mainline from six to eight lanes in both directions. This mitigation would result in LOS D or better during both peak hours and in both directions, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Also, it is subject to physical feasibility since the resulting 16-lane freeway would effectively eliminate the Manthey Road / Mossdale Road hook ramps. Therefore, this impact is considered significant and unavoidable.
- I-5 south of I-205 - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since it would worsen northbound p.m. peak hour operations from LOS C to LOS E.
  - *Mitigation:* Widen the northbound freeway mainline from three to four lanes. This mitigation would result in LOS D or better during both peak hours for the northbound direction, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact is considered significant and unavoidable.
- I-205 between I-5 and Paradise Avenue Interchanges - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since it would worsen eastbound p.m. peak hour and westbound a.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the freeway mainline from four to five lanes in both directions. This mitigation would result in LOS D or better during both peak hours and in both directions, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact is considered significant and unavoidable.
- I-205 between Paradise Avenue and MacArthur Drive Interchanges - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since it would worsen eastbound p.m. peak hour and westbound a.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the freeway mainline from four to five lanes in both directions. This mitigation would result in LOS D or better during both peak hours and in both directions, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact is considered significant and unavoidable.
- I-205 west of MacArthur Drive - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since it would worsen eastbound p.m. peak hour and westbound a.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the freeway mainline from four to six lanes in both directions. This mitigation would result in LOS D or better during both peak hours and in both directions, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact is considered significant and unavoidable.
- SR 120 east of I-5 - the full build of River Islands Phase 2B would cause a significant impact at this freeway mainline segment based on Caltrans standards of significance, since

it would worsen eastbound p.m. peak hour and westbound a.m. peak hour operations already at LOS F.

- *Mitigation:* Widen the freeway mainline from three to four lanes in the eastbound direction and three to five lanes in the westbound direction. This mitigation would result in LOS D or better during both peak hours and in both directions, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact is considered significant and unavoidable.

Table XXVI provides a summary of the resulting mitigated LOS for impacted freeway mainline segments under Year 2031 With Action Conditions. Detailed analysis sheets are included in Appendix I.

Table XXVI: Mitigated Freeway Mainline Levels of Service – Year 2031 With Action Conditions

ID	Segment	Direction	No. of Lanes (Mitigated)	A.M. Peak Hour			P.M. Peak Hour		
				Volume	Density	LOS	Volume	Density	LOS
1	I-5 North of Louise Ave. Interchange	NB	4	4,478	15.2	B	8,944	29.6	D
		SB	4	8,290	28.8	D	6,306	19.7	C
3	I-5 Between SR-120 & Manthey/Mossdale Hook Ramps	NB	6	5,359	11.3	B	14,096	28.9	D
		SB	6	14,267	32.3	D	7,777	15.2	B
4	I-5 Between Manthey/Mossdale Hook Ramps & I-205	NB	6	5,554	11.8	B	14,397	29.9	D
		SB	6	13,166	28.5	D	7,516	14.7	B
5	I-5 Just South of I-205	NB	3	2,612	11.1	B	6,171	24.4	D
6	I-205 Between I-5 & Paradise Ave. Interchange	EB	4	3,259	10.5	A	8,977	29.6	D
		WB	4	8,772	29.5	D	3,938	12.3	B
7	I-205 Between Paradise Ave. Interchange & MacArthur Dr. Interchange	EB	4	3,802	12.3	B	9,366	31.7	D
		WB	4	9,695	34.8	D	4,757	14.9	B
8	I-205 West of MacArthur Dr.	EB	4	3,966	10.7	A	10,020	26.8	D
		WB	4	10,345	28.7	D	5,078	13.2	B
9	SR-120 Just East of I-5	EB	3	1,668	7.4	A	7,035	28.5	D
		WB	3	7,090	25.1	D	2,603	8.1	A

Note: Density in passenger cars per mile per lane, LOS = Level of Service

Freeway Ramps

Expected significant impacts at study freeway ramp merge and diverge locations and potential mitigation measures are as follows:

- I-5 / Louise Avenue Northbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F by increasing diverge location traffic from the baseline by one percent or more.
  - *Mitigation:* Widen the northbound freeway mainline from four to five lanes. This mitigation would result in LOS D or better during both peak hours, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact would remain significant and unavoidable.

- I-5 / Louise Avenue Northbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the northbound freeway mainline from four to five lanes. This mitigation would still result in LOS F during the p.m. peak hour, which would not meet acceptable Caltrans operational standards. Further widening of the mainline may or may not be feasible and currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-5 / Louise Avenue Southbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen a.m. peak hour operations already at LOS F by increasing diverge location traffic from the baseline by one percent or more and worsen p.m. peak hour operations from LOS D to LOS F.
  - *Mitigation:* Widen the southbound freeway mainline from four to five lanes. While this mitigation would mitigate p.m. peak hour operations to an acceptable LOS D, it would still result in LOS F during the a.m. peak hour, which would not meet acceptable Caltrans operational standards. Further widening of the mainline may or may not be feasible and currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-5 / Louise Avenue Southbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen a.m. and p.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the southbound freeway mainline from four to five lanes. While this mitigation would mitigate a.m. peak hour operations to an acceptable LOS D, it would still result in LOS E during the p.m. peak hour, which would not meet acceptable Caltrans operational standards. Further widening of the mainline may or may not be feasible and currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-5 / Manthey Road Southbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen a.m. peak hour operations already at LOS F by increasing diverge location traffic from the baseline by one percent or more.
  - *Mitigation:* Since the programmed southbound mainline segment through this area consists of six lanes, further widening would in effect eliminate the Manthey Road hook ramps and therefore is not considered to be a feasible mitigation. Also, further widening currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-5 / Manthey Road Southbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen a.m. peak hour operations already at LOS F.
  - *Mitigation:* Since the programmed southbound mainline segment through this area consists of six lanes, further widening would in effect eliminate the Manthey Road hook ramps and therefore is not considered to be a feasible mitigation. Also, further widening currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.

- I-5 / Mossdale Road Northbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F.
    - *Mitigation:* Since the programmed northbound mainline segment through this area consists of six lanes, further widening would in effect eliminate the Mossdale Road hook ramps and therefore is not considered to be a feasible mitigation. Also, further widening currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-5 / Mossdale Road Northbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F.
    - *Mitigation:* Since the programmed northbound mainline segment through this area consists of six lanes, further widening would in effect eliminate the Mossdale Road hook ramps and therefore is not considered to be a feasible mitigation. Also, further widening currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-205 / MacArthur Drive Eastbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F.
    - *Mitigation:* Widen the eastbound freeway mainline from four to five lanes and eastbound off-ramp from one to two lanes. While this mitigation would mitigate a.m. peak hour operations to an acceptable LOS B, it would still result in LOS F during the p.m. peak hour, which would not meet acceptable Caltrans operational standards. Further widening of the mainline may or may not be feasible and currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-205 / MacArthur Drive Eastbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F.
    - *Mitigation:* Widen the eastbound freeway mainline from four to five lanes and eastbound on-ramp from one to two lanes. This mitigation would result in LOS D or better during both peak hours, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-205 / MacArthur Drive Westbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen a.m. peak hour operations already at LOS F by increasing diverge location traffic from the baseline by one percent or more.
    - *Mitigation:* Widen the westbound freeway mainline from four to five lanes and westbound off-ramp from one to two lanes. This mitigation would result in LOS D or better during both peak hours, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-205 / MacArthur Drive Westbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen a.m. peak hour operations already at LOS F by increasing merge location traffic from the baseline by one percent or more.

- *Mitigation:* Widen the westbound freeway mainline from four to five lanes and westbound on-ramp from one to two lanes. While this mitigation would mitigate p.m. peak hour operations to an acceptable LOS B, it would still result in LOS F during the a.m. peak hour, which would not meet acceptable Caltrans operational standards. Further widening of the mainline may or may not be feasible and currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.

- I-205 / Paradise Road Eastbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the eastbound freeway mainline from four to five lanes and eastbound off-ramp from one to two lanes. While this mitigation would mitigate a.m. peak hour operations to an acceptable LOS B, it would still result in LOS F during the p.m. peak hour, which would not meet acceptable Caltrans operational standards. Further widening of the mainline may or may not be feasible and currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-205 / Paradise Road Eastbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen p.m. peak hour operations already at LOS F by increasing merge location traffic from the baseline by one percent or more.
  - *Mitigation:* Widen the eastbound freeway mainline from four to five lanes and eastbound on-ramp from one to two lanes. This mitigation would result in LOS D or better during both peak hours, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-205 / Paradise Road Westbound Off-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway diverge location based on Caltrans standards of significance, since it would worsen a.m. peak hour operations already at LOS F.
  - *Mitigation:* Widen the westbound freeway mainline from four to five lanes and westbound off-ramp from one to two lanes. This mitigation would result in LOS D or better during both peak hours, which is within acceptable Caltrans operational standards. However, this mitigation is not programmed or funded. Therefore, this impact would remain significant and unavoidable.
- I-205 / Paradise Road Westbound On-Ramp - the full build of River Islands Phase 2B would cause a significant impact at this freeway merge location based on Caltrans standards of significance, since it would worsen a.m. peak hour operations already at LOS F by increasing merge location traffic from the baseline by one percent or more.
  - *Mitigation:* Widen the westbound freeway mainline from four to five lanes and westbound on-ramp from one to two lanes. While this mitigation would mitigate p.m. peak hour operations to an acceptable LOS C, it would still result in LOS F during the a.m. peak hour, which would not meet acceptable Caltrans operational standards. Further widening of the mainline may or may not be feasible and currently is not programmed or funded. Therefore, this impact would remain significant and unavoidable.

Table XXVII provides a summary of the resulting mitigated LOS for impacted freeway ramp merge and diverge locations under Year 2031 With Action Conditions. Detailed analysis sheets are included in Appendix I.

Table XXVII: Mitigated Freeway Ramp Levels of Service – Year 2031 With Action Conditions

ID	*Interchange*	*Ramp*	*Condition*	*Ramp Lanes (Mitigated)*	*Freeway Lanes (Mitigated)*	*Year 2031 With Action Conditions (Mitigated)*	
						A.M. Peak Hour LOS	*P.M. Peak Hour LOS*
1	I-5 / Louise Ave.	NB Off	Diverge	2	5	B	D
		NB On	Merge	2	5	C	**F**
		SB Off	Diverge	2	5	**F**	D
		SB On	Merge	2	5	D	**E**
2	I-5 / Manthey Rd.	SB Off	Diverge	1 *	6 *	*	*
		SB On	Merge	1 *	6 *	*	*
3	I-5 / Mossdale Rd.	NB Off	Diverge	1 *	6 *	*	*
		NB On	Merge	1 *	6 *	*	*
4	I-205 / MacArthur Dr.	EB Off	Diverge	2	5	B	**F**
		EB On	Merge	2	5	B	D
		WB Off	Diverge	2	5	D	B
		WB On	Merge	2	5	**F**	B
5	I-205 / Paradise Rd.	EB Off	Diverge	2	5	B	**F**
		EB On	Merge	2	5	B	D
		WB Off	Diverge	2	5	D	C
		WB On	Merge	2	5	**F**	C

Notes: 1) LOS=Level of Service
2) **Bold** indicates that results of mitigation are still expected to result in unacceptable operations. Further widening is infeasible and as a result would create a significant and unavoidable impact.
* Further widening of mainline at Manthey Road and Mossdale Road hook ramp locations would effectively eliminate these ramps, and thus are not analyzed for mitigation.

Study References

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Traffic Data Collection

Quality Traffic Data (September 2009)

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Ramon Batista	River Islands
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Andrew Chesley	San Joaquin Council of Governments
Kim Kloeb	San Joaquin Council of Governments
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Appendix A – Level of Service Methodology

APPENDIX A
LEVEL OF SERVICE

The description and procedures for calculating capacity and level of service (LOS) are found in Transportation Research Board, *Highway Capacity Manual 2000*. *Highway Capacity Manual 2000* represents the latest research on capacity and quality of service for transportation facilities.

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six levels of service are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of these conditions. Safety is not included in the measures that establish service levels.

A general description of service levels for various types of facilities is shown in Table A-I

Table A-I: Level of Service Description

	Uninterrupted Flow	***Interrupted Flow***
Facility Type	Freeways Multi-lane Highways Two-lane Highways Urban Streets	Signalized Intersections Unsignalized Intersections Two-way Stop Control All-way Stop Control
LOS		
A	Free-flow	Very low delay.
B	Stable flow. Presence of other users noticeable.	Low delay.
C	Stable flow. Comfort and convenience starts to decline.	Acceptable delay.
D	High-density stable flow.	Tolerable delay.
E	Unstable flow.	Limit of acceptable delay.
F	Forced or breakdown flow.	Unacceptable delay

Source: *Highway Capacity Manual 2000*

Urban Streets

The term "urban streets" refers to urban arterials and collectors, including those in downtown areas.

Arterial streets are roads that primarily serve longer through trips. However, providing access to abutting commercial and residential land uses is also an important function of arterials.
Collector streets provide both land access and traffic circulation within residential, commercial and industrial areas. Their access function is more important than that of arterials, and unlike arterials their operation is not always dominated by traffic signals.

Downtown streets are signalized facilities that often resemble arterials. They not only move through traffic but also provide access to local businesses for passenger cars, transit buses, and trucks.

Pedestrian conflicts and lane obstructions created by stopping or standing buses, trucks and parking vehicles that cause turbulence in the traffic flow are typical of downtown streets.

The speed of vehicles on urban streets is influenced by three main factors, street environment, interaction among vehicles and traffic control. As a result, these factors also affect quality of service.

The street environment includes the geometric characteristics of the facility, the character of roadside activity and adjacent land uses. Thus, the environment reflects the number and width of lanes, type of median, driveway density, spacing between signalized intersections, existence of parking, level of pedestrian activity and speed limit.

The interaction among vehicles is determined by traffic density, the proportion of trucks and buses, and turning movements. This interaction affects the operation of vehicles at intersections and, to a lesser extent, between signals.

Traffic control (including signals and signs) forces a portion of all vehicles to slow or stop. The delays and speed changes caused by traffic control devices reduce vehicle speeds, however, such controls are needed to establish right-of-way.

The average travel speed for through vehicles along an urban street is the determinant of the operating LOS. The travel speed along a segment, section or entire length of an urban street is dependent on the running speed between signalized intersections and the amount of control delay incurred at signalized intersections.

LOS A describes primarily free-flow operations. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal.

LOS B describes reasonably unimpeded operations. The ability to maneuver within the traffic stream is only slightly restricted, and control delays at signalized intersections are not significant.

LOS C describes stable operations, however, ability to maneuver and change lanes in midblock location may be more restricted than at LOS B. Longer queues, adverse signal coordination, or both may contribute to lower travel speeds.

LOS D borders on a range in which in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors.

LOS E is characterized by significant delays and lower travel speeds. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.

LOS F is characterized by urban street flow at extremely low speeds. Intersection congestion is likely at critical signalized locations, with high delays, high volumes, and extensive queuing.

The methodology to determine LOS stratifies urban streets into four classifications. The classifications are complex, and are related to functional and design categories. Table A-II describes the functional and design categories, while Table A-III relates these to the urban street classification.

Once classified, the urban street is divided into segments for analysis. An urban street segment is a one-way section of street encompassing a series of blocks or links terminating at a signalized intersection. Adjacent segments of urban streets may be combined to form larger street sections, provided that the segments have similar demand flows and characteristics.

Levels of service are related to the average travel speed of vehicles along the urban street segment or section.

Travel times for existing conditions are obtained by field measurements. The maximum-car technique is used. The vehicle is driven at the posted speed limit unless impeded by actual traffic conditions. In the maximum-car technique, a safe level of vehicular operation is maintained by observing proper following distances and by changing speeds at reasonable rates of acceleration and deceleration. The maximum-car technique provides the best base for measuring traffic performance.

An observer records the travel time and locations and duration of delay. The beginning and ending points are the centers of intersections. Delays include times waiting in queues at signalized intersections. The travel speed is determined by dividing the length of the segment by the travel time. Once the travel speed on the arterial is determined, the LOS is found by comparing the speed to the criteria in Table A-IV. LOS criteria vary for the different classifications of urban street, reflecting differences in driver expectations.

Table A-II: Functional and Design Categories for Urban Streets

Criterion	*Functional Category*			
	Principal Arterial		*Minor Arterial*	
Mobility function	Very important		Important	
Access function	Very minor		Substantial	
Points connected	Freeways, important activity centers, major traffic generators		Principal arterials	
Predominant trips served	Relatively long trips between major points and through trips entering, leaving, and passing through city		Trips of moderate length within relatively small geographical areas	
Criterion	*Design Category*			
	High-Speed	*Suburban*	*Intermediate*	*Urban*
Driveway access density	Very low density	Low density	Moderate density	High density
Arterial type	Multilane divided; undivided or two-lane with shoulders	Multilane divided: undivided or two-lane with shoulders	Multilane divided or undivided; one way, two lane	Undivided one way; two way, two or more lanes
Parking	No	No	Some	Usually
Separate left-turn lanes	Yes	Yes	Usually	Some
Signals per mile	0.5 to 2	1 to 5	4 to 10	6 to 12
Speed limits	45 to 55 mph	40 to 45 mph	30 to 40 mph	25 to 35 mph
Pedestrian activity	Very little	Little	Some	Usually
Roadside development	Low density	Low to medium density	Medium to moderate density	High density

Source: *Highway Capacity Manual 2000*

Table A-III: Urban Street Class based on Function and Design Categories

Design Category	Functional Category	
	Principal Arterial	***Minor Arterial***
High-Speed	I	Not applicable
Suburban	II	II
Intermediate	II	III or IV
Urban	III or IV	IV

Source: *Highway Capacity Manual 2000*

Table A-IV: Urban Street Levels of Service by Class

Urban Street Class	***I***	***II***	***III***	***IV***
Range of Free Flow Speeds (mph)	45 to 55	35 to 45	30 to 35	25 to 35
Typical Free Flow Speed (mph)	50	40	33	30
LOS	***Average Travel Speed (mph)***			
A	>42	>35	>30	>25
B	>34	>28	>24	>19
C	>27	>22	>18	>13
D	>21	>17	>14	>9
E	>16	>13	>10	>7
F	≤16	≤13	≤10	≤7

Source: *Highway Capacity Manual 2000*

Interrupted Flow

One of the more important elements limiting, and often interrupting the flow of traffic on a highway is the intersection. Flow on an interrupted facility is usually dominated by points of fixed operation such as traffic signals, stop and yield signs. These all operate quite differently and have differing impacts on overall flow.

Signalized Intersections

The capacity of a highway is related primarily to the geometric characteristics of the facility, as well as to the composition of the traffic stream on the facility. Geometrics are a fixed, or non-varying, characteristic of a facility.

At the signalized intersection, an additional element is introduced into the concept of capacity: time allocation. A traffic signal essentially allocates time among conflicting traffic movements seeking use of the same physical space. The way in which time is allocated has a significant impact on the operation of the intersection and on the capacity of the intersection and its approaches.

LOS for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, *i. e.,* in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Specifically, LOS criteria for traffic signals are stated in terms of average control delay per vehicle, typically for a 15-minute analysis period. Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the ratio of green time to cycle length and the volume to capacity ratio for the lane group.

For each intersection analyzed the average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection. A LOS designation is given to the control delay to better describe the level of operation. A description of levels of service for signalized intersections can be found in Table A-V

Table A-V: Description of Level of Service for Signalized Intersections

LOS	*Description*
A	Very low control delay, up to 10 seconds per vehicle. Progression is extremely favorable, and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.
B	Control delay greater than 10 and up to 20 seconds per vehicle. There is good progression or short cycle lengths or both. More vehicles stop causing higher levels of delay.
C	Control delay greater than 20 and up to 35 seconds per vehicle. Higher delays are caused by fair progression or longer cycle lengths or both. Individual cycle failures may begin to appear. Cycle failure occurs when a given green phase doe not serve queued vehicles, and overflow occurs. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.
D	Control delay greater than 35 and up to 55 seconds per vehicle. The influence of congestions becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volumes. Many vehicles stop, the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Control delay greater than 55 and up to 80 seconds per vehicle. The limit of acceptable delay. High delays usually indicate poor progression, long cycle lengths, and high volumes. Individual cycle failures are frequent.
F	Control delay in excess of 80 seconds per vehicle. Unacceptable to most drivers. Oversaturation, arrival flow rates exceed the capacity of the intersection. Many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to higher delay.

Source: *Highway Capacity Manual 2000*

The use of control delay, which may also be referred to as signal delay, was introduced in the 1997 update to the *Highway Capacity Manual*, and represents a departure from previous updates. In the third edition, published in 1985 and the 1994 update to the third edition, delay only included stopped delay. Thus, the LOS criteria listed in Table A-V differs from earlier criteria.

Unsignalized Intersections

The current procedures on unsignalized intersections were first introduced in the 1997 update to the *Highway Capacity Manual* and represent a revision of the methodology published in the 1994 update to the 1985 *Highway Capacity Manual*. The revised procedures use control delay as a measure of effectiveness to determine LOS. Delay is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, *i. e.,* in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Control delay is the increased time of travel for a vehicle approaching and passing through an unsignalized intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection.

Two-Way Stop Controlled Intersections
Two-way stop controlled intersections in which stop signs are used to assign the right-of-way, are the most prevalent type of intersection in the United States. At two-way stop-controlled intersections the stop-controlled approaches are referred as the minor street approaches and can be either public streets or private driveways. The approaches that are not controlled by stop signs are referred to as the major street approaches.

The capacity of movements subject to delay are determined using the "critical gap" method of capacity analysis. Expected average control delay based on movement volume and movement capacity is calculated. A LOS designation is given to the expected control delay for each minor movement. LOS is not defined for the intersection as a whole. Control delay is the increased time of travel for a vehicle approaching and passing through a stop-controlled intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection. A description of levels of service for two-way stop-controlled intersections is found in Table A-VI.

Table A-VI: Description of Level of Service for Two-Way Stop Controlled Intersections

LOS	*Description*
A	Very low control delay less than 10 seconds per vehicle for each movement subject to delay.
B	Low control delay greater than 10 and up to 15 seconds per vehicle for each movement subject to delay.
C	Acceptable control delay greater than 15 and up to 25 seconds per vehicle for each movement subject to delay.
D	Tolerable control delay greater than 25 and up to 35 seconds per vehicle for each movement subject to delay.
E	Limit of tolerable control delay greater than 35 and up to 50 seconds per vehicle for each movement subject to delay.
F	Unacceptable control delay in excess of 50 seconds per vehicle for each movement subject to delay.

Source: *Highway Capacity Manual 2000*

Appendix B – Existing Traffic Counts

PEAK HOUR ITM SUMMARY

#001 Manthey Road & Louis Avenue

LOCATION#:	001	QTD PROJ#:	090137	AM PEAK:	700 AM
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	430 PM

N

Manthey Road (North leg) – Southbound approach

	Right	Thru	Left
LN	0.5	0	0.5
AM	93	0	72
MD	0	0	0
PM	89	0	26
TOTAL	182	0	98

Manthey Road (North leg) – Northbound departure

TOTAL	309
PM	131
MD	0
AM	178

Louis Avenue (West leg) – Westbound departure

TOTAL	PM	MD	AM
856	515	0	341

Louis Avenue

Louis Avenue (West leg) – Eastbound approach

LN	AM	MD	PM	TOTAL
1	163	0	94	257
1	274	0	311	585
0	0	0	0	0

NORTH

WEST **1-WAY STOP (SB)** EAST

SOUTH

Louis Avenue (East leg) – Westbound approach

TOTAL	PM	MD	AM	LN
52	37	0	15	1
674	426	0	248	1
0	0	0	0	0

Louis Avenue

Louis Avenue (East leg) – Eastbound departure

AM	MD	PM	TOTAL
346	0	337	683

Manthey Road (South leg) – Southbound departure

AM	0
MD	0
PM	0
TOTAL	0

Manthey Road

Manthey Road (South leg) – Northbound approach

	Left	Thru	Right
TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#001 Manthey Road & Louis Avenue - AM PEAK

LOCATION#:	**001**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	0	0	0.5	0	0.5	1	1	0	0	1	1	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	0	19	0	25	32	57	0	0	45	4	182
7:15 AM	0	0	0	25	0	34	55	64	0	0	62	8	248
7:30 AM	0	0	0	16	0	19	43	81	0	0	72	1	232
7:45 AM	0	0	0	12	0	15	33	72	0	0	69	2	203
8:00 AM	0	0	0	6	0	11	14	75	0	0	70	2	178
8:15 AM	0	0	0	5	0	18	20	85	0	0	66	3	197
8:30 AM	0	0	0	2	0	15	15	74	0	0	51	7	164
8:45 AM	0	0	0	2	0	6	11	52	0	0	51	3	125
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	0	0	87	0	143	223	560	0	0	486	30	1529
P.H.V: (1)	0	0	0	72	0	93	163	274	0	0	248	15	865
P.H.F: (2)		0.000			0.699			0.881			0.901		0.872

(1) Peak Hour Volume (Peak Hour Begins At 700 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#001 Manthey Road & Louis Avenue - PM PEAK

LOCATION#:	**001**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	1	1	0	0	1	1	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	1	0	12	18	76	0	0	78	4	189
4:15 PM	0	0	0	8	0	13	20	95	0	0	79	9	224
4:30 PM	0	0	0	3	0	20	21	88	0	0	94	10	236
4:45 PM	0	0	0	4	0	21	23	87	0	0	104	3	242
5:00 PM	0	0	0	6	0	28	24	68	0	0	113	9	248
5:15 PM	0	0	0	13	0	20	26	68	0	0	115	15	257
5:30 PM	0	0	0	2	0	16	17	61	0	0	118	4	218
5:45 PM	0	0	0	2	0	13	25	76	0	0	96	5	217
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	39	0	143	174	619	0	0	797	59	1831
P.H.V: 1	0	0	0	26	0	89	94	311	0	0	426	37	983
P.H.F: 2		0.000			0.846			0.920			0.890		0.956

(1) Peak Hour Volume (Peak Hour Begins At 430 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#001 Manthey Road & Louis Avenue

LOCATION#:	001	QTD PROJ#:	090137	AM PEAK:	800 AM
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	430 PM

Manthey Road (north leg) – southbound approach

LN	0.5	0	0.5
AM	2	0	3
MD	0	0	0
PM	2	0	5
TOTAL	4	0	8

Manthey Road (north leg) – northbound departure

TOTAL	9
PM	7
MD	0
AM	2

Louis Avenue (west leg) – westbound departure

TOTAL	PM	MD	AM
18	6	0	12

Louis Avenue

Louis Avenue (west leg) – eastbound approach

LN	AM	MD	PM	TOTAL
1	1	0	3	4
1	2	0	11	13
0	0	0	0	0

NORTH

WEST | **1-WAY STOP (SB)** | EAST

SOUTH

Louis Avenue (east leg) – westbound approach

TOTAL	PM	MD	AM	LN
5	4	0	1	1
14	4	0	10	1
0	0	0	0	0

Louis Avenue

Louis Avenue (east leg) – eastbound departure

AM	MD	PM	TOTAL
5	0	16	21

Manthey Road (south leg) – southbound departure

AM	0
MD	0
PM	0
TOTAL	0

Manthey Road (south leg) – northbound approach

TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#001 Manthey Road & Louis Avenue - AM PEAK

LOCATION#:	**001**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	0	0	0.5	0	0.5	1	1	0	0	1	1	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
7:30 AM	0	0	0	0	0	0	0	1	0	0	5	0	6
7:45 AM	0	0	0	1	0	0	0	0	0	0	1	0	2
8:00 AM	0	0	0	1	0	1	0	0	0	0	6	0	8
8:15 AM	0	0	0	0	0	0	1	1	0	0	1	0	3
8:30 AM	0	0	0	0	0	1	0	1	0	0	2	0	4
8:45 AM	0	0	0	2	0	0	0	0	0	0	1	1	4
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	0	0	4	0	2	1	3	0	0	17	1	28
P.H.V: 1	0	0	0	3	0	2	1	2	0	0	10	1	19
P.H.F: 2		0.000			0.625			0.375			0.458		0.594

(1) Peak Hour Volume (Peak Hour Begins At 800 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#001 Manthey Road & Louis Avenue - PM PEAK

LOCATION#:	**001**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**		**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Louis Avenue**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0.5	0	0.5	1	1	0	0	1	1	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	0	0	1	0	1	0	0	4	1	7
4:15 PM	0	0	0	0	0	0	2	0	0	0	2	2	6
4:30 PM	0	0	0	0	0	2	2	4	0	0	1	0	9
4:45 PM	0	0	0	0	0	0	0	5	0	0	2	0	7
5:00 PM	0	0	0	1	0	0	0	0	0	0	0	1	2
5:15 PM	0	0	0	4	0	0	1	2	0	0	1	3	11
5:30 PM	0	0	0	0	0	0	0	0	0	0	4	0	4
5:45 PM	0	0	0	0	0	0	1	0	0	0	0	0	1
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	5	0	3	6	12	0	0	14	7	47
P.H.V: (1)	0	0	0	5	0	2	3	11	0	0	4	4	29
P.H.F: (2)		0.000			0.438			0.583			0.500		0.659

(1) Peak Hour Volume (Peak Hour Begins At 430 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#002 I-5 SB Ramps & Louis Avenue

LOCATION#:	002	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	I-5 SB Ramps	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	445 PM

I-5 SB Ramps (North leg, southbound approach)

LN	0.3	0.3	1.3
AM	87	5	272
MD	0	0	0
PM	108	1	265
TOTAL	195	6	537

I-5 SB Ramps (North leg, northbound departure)

TOTAL	0
PM	0
MD	0
AM	0

Louis Avenue (West leg, westbound departure)

TOTAL	PM	MD	AM
755	476	0	279

Louis Avenue (East leg, westbound approach)

TOTAL	PM	MD	AM	LN
0	0	0	0	0
560	368	0	192	1
613	262	0	351	1

NORTH

WEST **SIGNALIZED** EAST

SOUTH

Louis Avenue (West leg, eastbound approach)

LN	AM	MD	PM	TOTAL
0	0	0	0	0
1	243	0	223	466
0	116	0	94	210

Louis Avenue (East leg, eastbound departure)

AM	MD	PM	TOTAL
515	0	488	1003

I-5 SB Ramps (South leg, southbound departure)

AM	472
MD	0
PM	357
TOTAL	829

I-5 SB Ramps (South leg, northbound approach)

TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT 7:00 AM TO 9:00 AM **MD COUNT** - TO - **PM COUNT** 4:00 PM TO 6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#002 I-5 SB Ramps & Louis Avenue - AM PEAK

LOCATION#:	002	QTD PROJ#:	090137
NORTH / SOUTH:	I-5 SB Ramps	DATE:	Thursday, September 03, 2009
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	1.3	0.3	0.3	0	1	0	1	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	0	41	0	12	0	55	22	63	35	0	228
7:15 AM	0	0	0	54	2	19	0	57	33	91	50	0	306
7:30 AM	0	0	0	67	1	21	0	71	28	102	49	0	339
7:45 AM	0	0	0	96	2	24	0	63	23	89	44	0	341
8:00 AM	0	0	0	55	0	23	0	52	32	69	49	0	280
8:15 AM	0	0	0	59	1	10	0	65	28	58	57	0	278
8:30 AM	0	0	0	51	0	14	0	54	22	66	42	0	249
8:45 AM	0	0	0	57	0	16	0	36	20	65	36	0	230
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	480	6	139	0	453	208	603	362	0	2251
P.H.V: 1	0	0	0	272	5	87	0	243	116	351	192	0	1266
P.H.F: 2		0.000			0.746			0.907			0.899		0.928

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#002 I-5 SB Ramps & Louis Avenue - PM PEAK

LOCATION#:	**002**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 SB Ramps**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	1.3	0.3	0.3	0	1	0	1	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	39	0	20	0	57	21	40	59	0	236
4:15 PM	0	0	0	57	1	24	0	76	27	64	63	0	312
4:30 PM	0	0	0	62	1	26	0	64	27	61	75	0	316
4:45 PM	0	0	0	68	1	22	0	63	30	52	84	0	320
5:00 PM	0	0	0	55	0	31	0	56	19	75	90	0	326
5:15 PM	0	0	0	72	0	31	0	60	24	72	98	0	357
5:30 PM	0	0	0	70	0	24	0	44	21	63	96	0	318
5:45 PM	0	0	0	72	0	26	0	66	15	56	74	0	309
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	495	3	204	0	486	184	483	639	0	2494
P.H.V: 1	0	0	0	265	1	108	0	223	94	262	368	0	1321
P.H.F: 2		0.000			0.908			0.852			0.926		0.925

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#002 I-5 SB Ramps & Louis Avenue

LOCATION#:	002	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	I-5 SB Ramps	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	430 PM

I-5 SB Ramps (North Leg) – Southbound Approach

	Right	Through	Left
LN	0.3	0.3	1.3
AM	6	2	26
MD	0	0	0
PM	1	1	26
TOTAL	7	3	52

I-5 SB Ramps (North Leg) – Northbound Departure

TOTAL	PM	MD	AM
0	0	0	0

Louis Avenue (West Leg) – Westbound Departure

TOTAL	PM	MD	AM
18	8	0	10

Louis Avenue (East Leg) – Westbound Approach

Movement	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	11	7	0	4	1
Left	108	49	0	59	1

NORTH

WEST **SIGNALIZED** EAST

SOUTH

Louis Avenue (West Leg) – Eastbound Approach

Movement	LN	AM	MD	PM	TOTAL
Left	0	0	0	0	0
Through	1	2	0	10	12
Right	0	2	0	6	8

Louis Avenue (East Leg) – Eastbound Departure

AM	MD	PM	TOTAL
28	0	36	64

I-5 SB Ramps (South Leg) – Southbound Departure

AM	MD	PM	TOTAL
63	0	56	119

I-5 SB Ramps (South Leg) – Northbound Approach

	Left	Through	Right
TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#002 I-5 SB Ramps & Louis Avenue - AM PEAK

LOCATION#:	**002**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 SB Ramps**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	0	0	1.3	0.3	0.3	0	1	0	1	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	0	2	0	0	0	0	0	3	0	0	5
7:15 AM	0	0	0	9	0	0	0	0	1	9	1	0	20
7:30 AM	0	0	0	12	0	1	0	1	0	7	4	0	25
7:45 AM	0	0	0	7	1	0	0	0	1	20	1	0	30
8:00 AM	0	0	0	5	0	5	0	1	0	14	1	0	26
8:15 AM	0	0	0	8	1	0	0	1	0	9	1	0	20
8:30 AM	0	0	0	6	0	1	0	0	1	16	1	0	25
8:45 AM	0	0	0	5	0	1	0	1	1	18	1	0	27
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	0	0	54	2	8	0	4	4	96	10	0	178
P.H.V: 1	0	0	0	26	2	6	0	2	2	59	4	0	101
P.H.F: 2		0.000			0.850			1.000			0.750		0.842

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#002 I-5 SB Ramps & Louis Avenue - PM PEAK

LOCATION#:	002	QTD PROJ#:	090137
NORTH / SOUTH:	I-5 SB Ramps	DATE:	Thursday, September 03, 2009
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	1.3	0.3	0.3	0	1	0	1	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	7	0	1	0	0	1	1	4	0	14
4:15 PM	0	0	0	5	0	1	0	0	0	12	3	0	21
4:30 PM	0	0	0	7	1	0	0	2	2	16	1	0	29
4:45 PM	0	0	0	6	0	0	0	3	2	10	2	0	23
5:00 PM	0	0	0	4	0	0	0	1	0	12	1	0	18
5:15 PM	0	0	0	9	0	1	0	4	2	11	3	0	30
5:30 PM	0	0	0	4	0	0	0	0	0	13	4	0	21
5:45 PM	0	0	0	2	0	0	0	0	0	8	0	0	10
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	44	1	3	0	10	7	83	18	0	166
P.H.V: 1	0	0	0	26	1	1	0	10	6	49	7	0	100
P.H.F: 2		0.000			0.700			0.667			0.824		0.833

(1) Peak Hour Volume (Peak Hour Begins At 430 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#003 I-5 NB Ramps & Louis Avenue

LOCATION#:	003	QTD PROJ#:	090137	AM PEAK:	730 AM
NORTH / SOUTH:	I-5 NB Ramps	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

SIGNALIZED

NORTH / SOUTH / EAST / WEST

I-5 NB Ramps (North leg) – Southbound approach

	Right	Through	Left
LN	0	0	0
AM	0	0	0
MD	0	0	0
PM	0	0	0
TOTAL	0	0	0

I-5 NB Ramps (North leg) – Northbound departure

TOTAL	PM	MD	AM
762	430	0	332

Louis Avenue (West leg) – Westbound departure

TOTAL	PM	MD	AM
1058	552	0	506

Louis Avenue (East leg) – Westbound approach

Movement	TOTAL	PM	MD	AM	LN
Right	656	378	0	278	1
Through	852	417	0	435	1
Left	0	0	0	0	0

Louis Avenue (West leg) – Eastbound approach

Movement	LN	AM	MD	PM	TOTAL
Left	1	52	0	52	104
Through	2	479	0	456	935
Right	0	0	0	0	0

Louis Avenue (East leg) – Eastbound departure

AM	MD	PM	TOTAL
731	0	891	1622

I-5 NB Ramps (South leg) – Southbound departure

AM	MD	PM	TOTAL
0	0	0	0

I-5 NB Ramps (South leg) – Northbound approach

	Left	Through	Right
TOTAL	206	2	687
PM	135	0	435
MD	0	0	0
AM	71	2	252
LN	0.5	0.5	1

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#003 I-5 NB Ramps & Louis Avenue - AM PEAK

LOCATION#:	**003**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 NB Ramps**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0.5	0.5	1	0	0	0	1	2	0	0	1	1	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	9	0	28	0	0	0	5	93	0	0	85	42	262
7:15 AM	17	0	36	0	0	0	13	101	0	0	113	59	339
7:30 AM	22	0	48	0	0	0	10	128	0	0	119	71	398
7:45 AM	15	0	71	0	0	0	15	147	0	0	119	90	457
8:00 AM	21	1	74	0	0	0	10	97	0	0	96	60	359
8:15 AM	13	1	59	0	0	0	17	107	0	0	101	57	355
8:30 AM	10	0	54	0	0	0	17	89	0	0	94	66	330
8:45 AM	8	0	75	0	0	0	11	83	0	0	88	51	316
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	115	2	445	0	0	0	98	845	0	0	815	496	2816
P.H.V: 1	71	2	252	0	0	0	52	479	0	0	435	278	1569
P.H.F: 2		0.846			0.000			0.819			0.853		0.858

(1) Peak Hour Volume (Peak Hour Begins At 730 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#003 I-5 NB Ramps & Louis Avenue - PM PEAK

LOCATION#:	**003**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 NB Ramps**		**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**Louis Avenue**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0.5	0.5	1	0	0	0	1	2	0	0	1	1	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	26	0	92	0	0	0	6	90	0	0	85	85	384
4:15 PM	34	0	115	0	0	0	11	124	0	0	107	107	498
4:30 PM	34	0	114	0	0	0	8	119	0	0	100	86	461
4:45 PM	36	0	113	0	0	0	14	119	0	0	104	92	478
5:00 PM	31	0	93	0	0	0	19	94	0	0	106	93	436
5:15 PM	47	7	94	0	0	0	23	112	0	0	121	75	479
5:30 PM	53	1	110	0	0	0	15	100	0	0	106	65	450
5:45 PM	39	0	103	0	0	0	14	127	0	0	89	62	434
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	300	8	834	0	0	0	110	885	0	0	818	665	3620
P.H.V: 1	135	0	435	0	0	0	52	456	0	0	417	378	1873
P.H.F: 2		0.956			0.000			0.941			0.929		0.940

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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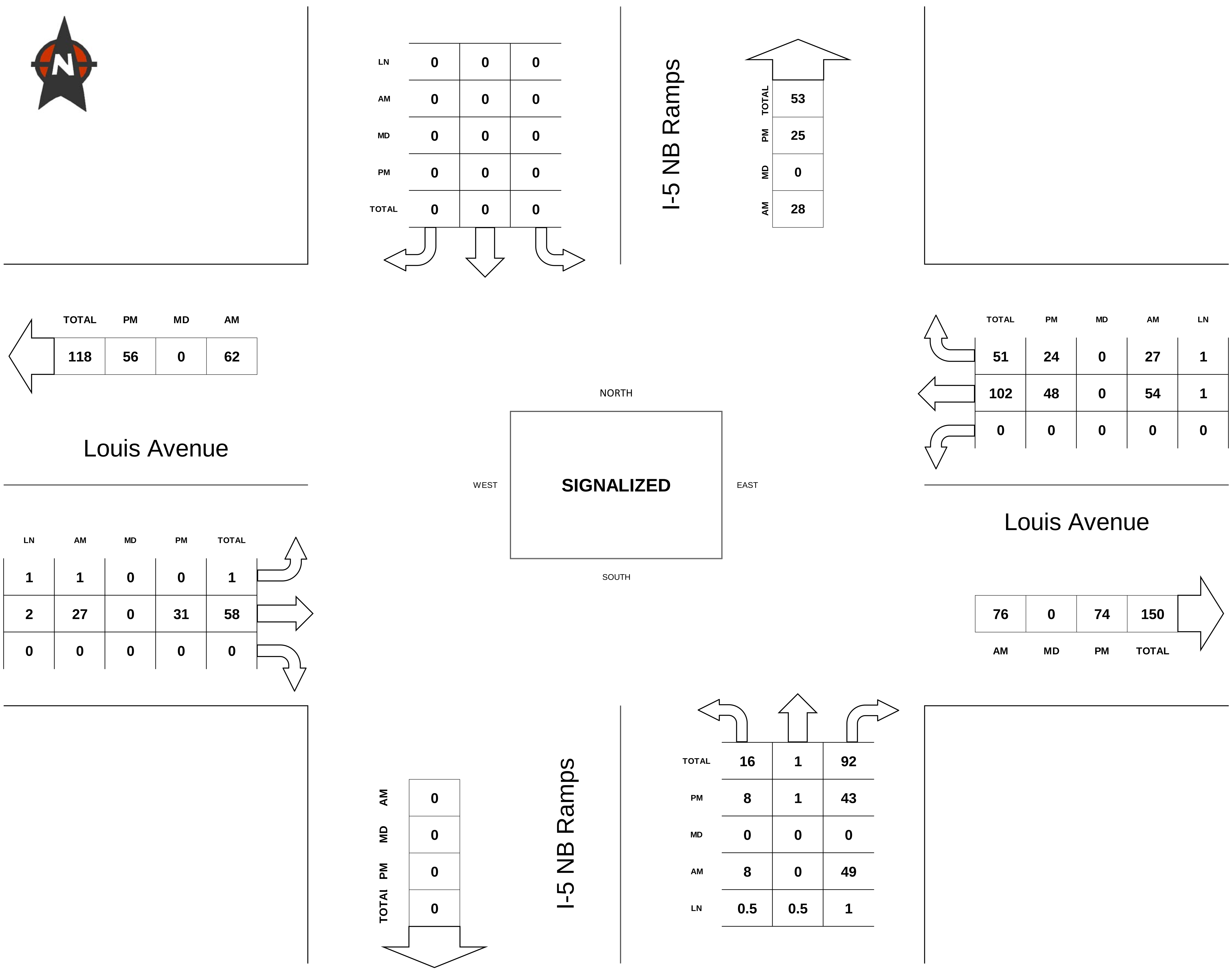
PEAK HOUR ITM SUMMARY (TRUCKS)

#003 I-5 NB Ramps & Louis Avenue

LOCATION#:	003	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	I-5 NB Ramps	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	445 PM



AM COUNT 7:00 AM TO 9:00 AM **MD COUNT** - TO - **PM COUNT** 4:00 PM TO 6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#003 I-5 NB Ramps & Louis Avenue - AM PEAK

LOCATION#:	003		QTD PROJ#:	090137
NORTH / SOUTH:	I-5 NB Ramps		DATE:	Thursday, September 03, 2009
EAST / WEST:	Louis Avenue		VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0.5	0.5	1	0	0	0	1	2	0	0	1	1	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	3	0	0	0	0	2	0	0	3	0	8
7:15 AM	2	0	8	0	0	0	0	8	0	0	8	6	32
7:30 AM	2	0	7	0	0	0	0	13	0	0	9	4	35
7:45 AM	2	0	16	0	0	0	0	7	0	0	18	6	49
8:00 AM	4	0	12	0	0	0	0	6	0	0	11	10	43
8:15 AM	1	0	12	0	0	0	0	9	0	0	9	5	36
8:30 AM	1	0	9	0	0	0	1	5	0	0	16	6	38
8:45 AM	0	0	14	0	0	0	0	6	0	0	19	6	45
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	12	0	81	0	0	0	1	56	0	0	93	43	286
P.H.V: (1)	8	0	49	0	0	0	1	27	0	0	54	27	166
P.H.F: (2)		0.792			0.000			0.778			0.844		0.847

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#003 I-5 NB Ramps & Louis Avenue - PM PEAK

LOCATION#:	003		QTD PROJ#:	090137
NORTH / SOUTH:	I-5 NB Ramps		DATE:	Thursday, September 03, 2009
EAST / WEST:	Louis Avenue		VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0.5	0.5	1	0	0	0	1	2	0	0	1	1	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	1	0	4	0	0	0	0	7	0	0	4	3	19
4:15 PM	2	0	17	0	0	0	0	5	0	0	13	8	45
4:30 PM	1	0	5	0	0	0	0	9	0	0	16	5	36
4:45 PM	1	0	9	0	0	0	0	9	0	0	11	3	33
5:00 PM	2	0	10	0	0	0	0	5	0	0	11	12	40
5:15 PM	2	1	10	0	0	0	0	13	0	0	12	3	41
5:30 PM	3	0	14	0	0	0	0	4	0	0	14	6	41
5:45 PM	0	0	6	0	0	0	0	2	0	0	8	9	25
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	12	1	75	0	0	0	0	54	0	0	89	49	280
P.H.V: 1	8	1	43	0	0	0	0	31	0	0	48	24	155
P.H.F: 2		0.765			0.000			0.596			0.783		0.945

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#004 Harlan Road & Louis Avenue

LOCATION#:	004	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	Harlan Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

Harlan Road – Southbound approach (north leg)

	Right	Through	Left
LN	0	2	1
AM	24	27	23
MD	0	0	0
PM	12	51	45
TOTAL	36	78	68

Harlan Road – Northbound departure (north leg)

TOTAL	PM	MD	AM
549	352	0	197

Louis Avenue – Westbound departure (west leg)

TOTAL	PM	MD	AM
1294	658	0	636

Louis Avenue

Louis Avenue – Eastbound approach (west leg)

LN	AM	MD	PM	TOTAL
1	154	0	257	411
2	347	0	521	868
1	265	0	134	399

NORTH

WEST **SIGNALIZED** EAST

SOUTH

Louis Avenue – Westbound approach (east leg)

TOTAL	PM	MD	AM	LN
51	33	0	18	0
813	343	0	470	2
139	72	0	67	1

Louis Avenue

Louis Avenue – Eastbound departure (east leg)

AM	MD	PM	TOTAL
393	0	623	1016

Harlan Road – Southbound departure (south leg)

AM	MD	PM	TOTAL
359	0	257	616

Harlan Road

Harlan Road – Northbound approach (south leg)

	Left	Through	Right
TOTAL	445	87	80
PM	303	62	57
MD	0	0	0
AM	142	25	23
LN	2	0.5	0.5

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#004 Harlan Road & Louis Avenue - AM PEAK

LOCATION#: 004
NORTH / SOUTH: Harlan Road
EAST / WEST: Louis Avenue

QTD PROJ#: 090137
DATE: Wednesday, September 02, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	2	0.5	0.5	1	2	0	1	2	1	1	2	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	24	3	2	4	2	2	30	69	39	13	98	3	289
7:15 AM	29	9	7	3	8	4	31	87	52	12	121	5	368
7:30 AM	50	5	3	4	11	5	37	92	62	14	127	5	415
7:45 AM	35	6	4	11	3	3	44	78	87	21	127	4	423
8:00 AM	28	5	9	5	5	12	42	90	64	20	95	4	379
8:15 AM	32	5	3	9	3	5	43	76	51	25	77	10	339
8:30 AM	37	5	1	7	14	6	51	68	40	33	79	4	345
8:45 AM	33	7	5	12	10	3	34	85	64	34	60	13	360
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	268	45	34	55	56	40	312	645	459	172	784	48	2918
P.H.V: (1)	142	25	23	23	27	24	154	347	265	67	470	18	1585
P.H.F: (2)		0.819			0.841			0.916			0.913		0.937

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#004 Harlan Road & Louis Avenue - PM PEAK

LOCATION#: 004
NORTH / SOUTH: Harlan Road
EAST / WEST: Louis Avenue

QTD PROJ#: 090137
DATE: Wednesday, September 02, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	2	0.5	0.5	1	2	0	1	2	1	1	2	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	57	6	13	8	5	0	49	89	15	17	89	9	357
4:15 PM	61	13	8	7	12	3	65	134	37	22	99	6	467
4:30 PM	70	16	13	10	13	2	68	135	31	17	82	12	469
4:45 PM	89	23	15	14	17	3	67	138	41	22	76	8	513
5:00 PM	83	10	21	14	9	4	57	114	25	11	86	7	441
5:15 PM	61	9	11	8	4	1	60	138	32	11	76	11	422
5:30 PM	52	11	15	10	13	5	56	92	52	17	81	15	419
5:45 PM	95	19	12	3	16	6	57	80	32	10	47	4	381
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	568	107	108	74	89	24	479	920	265	127	636	72	3469
P.H.V: 1	303	62	57	45	51	12	257	521	134	72	343	33	1890
P.H.F: 2		0.831			0.794			0.927			0.882		0.921

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#004 Harlan Road & Louis Avenue

LOCATION#:	004	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	Harlan Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Louis Avenue	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

SIGNALIZED

NORTH / SOUTH / EAST / WEST

Harlan Road – Southbound approach (north leg)

LN	0	2	1
AM	11	1	3
MD	0	0	0
PM	3	6	3
TOTAL	14	7	6

Harlan Road – Northbound departure (north leg)

TOTAL	44
PM	16
MD	0
AM	28

Louis Avenue – Westbound departure (west leg)

TOTAL	PM	MD	AM
142	63	0	79

Louis Avenue – Westbound approach (east leg)

TOTAL	PM	MD	AM	LN
6	2	0	4	0
64	25	0	39	2
8	5	0	3	1

Louis Avenue – Eastbound approach (west leg)

LN	AM	MD	PM	TOTAL
1	17	0	8	25
2	32	0	25	57
1	32	0	37	69

Louis Avenue – Eastbound departure (east leg)

AM	MD	PM	TOTAL
36	0	31	67

Harlan Road – Southbound departure (south leg)

AM	36
MD	0
PM	48
TOTAL	84

Harlan Road – Northbound approach (south leg)

TOTAL	64	13	4
PM	35	6	3
MD	0	0	0
AM	29	7	1
LN	2	0.5	0.5

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#004 Harlan Road & Louis Avenue - AM PEAK

LOCATION#:	**004**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Harlan Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	2	0.5	0.5	1	2	0	1	2	1	1	2	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	4	0	1	0	0	0	1	3	3	0	6	1	19
7:15 AM	4	3	3	0	2	2	1	8	7	0	9	0	39
7:30 AM	6	0	0	0	1	2	5	11	6	1	6	1	39
7:45 AM	6	3	0	0	0	1	5	9	9	0	12	2	47
8:00 AM	6	2	0	1	1	6	4	10	6	2	11	0	49
8:15 AM	7	0	1	2	0	3	4	8	10	0	6	0	41
8:30 AM	10	2	0	0	0	1	4	5	7	1	10	2	42
8:45 AM	3	0	0	0	0	3	2	6	12	3	3	2	34
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	46	10	5	3	4	18	26	60	60	7	63	8	310
P.H.V: 1	29	7	1	3	1	11	17	32	32	3	39	4	179
P.H.F: 2		0.771			0.469			0.880			0.821		0.913

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#004 Harlan Road & Louis Avenue - PM PEAK

LOCATION#:	**004**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Harlan Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Louis Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	2	0.5	0.5	1	2	0	1	2	1	1	2	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	9	0	0	0	0	0	3	5	5	0	5	1	28
4:15 PM	7	2	0	0	1	2	2	10	12	2	7	0	45
4:30 PM	8	4	1	1	2	0	2	3	7	0	12	0	40
4:45 PM	12	0	1	1	1	0	3	6	9	2	2	1	38
5:00 PM	8	0	1	1	2	1	1	6	9	1	4	1	35
5:15 PM	10	1	1	1	1	0	7	5	10	0	4	0	40
5:30 PM	10	2	1	1	1	3	5	4	10	2	3	0	42
5:45 PM	9	1	0	0	2	3	5	0	4	0	1	0	25
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	73	10	5	5	10	9	28	39	66	7	38	3	293
P.H.V: 1	35	6	3	3	6	3	8	25	37	5	25	2	158
P.H.F: 2		0.846			0.750			0.729			0.667		0.878

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#005 Manthey Road & Stewart Road

LOCATION#:	005	QTD PROJ#:	090137	AM PEAK:	730 AM
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Stewart Road	VICINITY:	Lathrop, CA	PM PEAK:	445 PM

Manthey Road – Southbound approach

	Right	Through	Left
LN	0	1	0
AM	1	84	0
MD	0	0	0
PM	1	53	0
TOTAL	2	137	0

Manthey Road – Northbound departure

TOTAL	139
PM	88
MD	0
AM	51

Stewart Road – Westbound departure

TOTAL	PM	MD	AM
16	13	0	3

Stewart Road – Westbound approach

	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	0	0	0	0	0
Left	0	0	0	0	0

NORTH

WEST **1-WAY STOP (EB)** EAST

SOUTH

Stewart Road – Eastbound approach

	LN	AM	MD	PM	TOTAL
Left	0	2	0	3	5
Through	1	0	0	0	0
Right	0	2	0	4	6

Stewart Road – Eastbound departure

AM	MD	PM	TOTAL
0	0	0	0

Manthey Road – Southbound departure

AM	86
MD	0
PM	57
TOTAL	143

Manthey Road – Northbound approach

	Left	Through	Right
TOTAL	14	134	0
PM	12	85	0
MD	0	0	0
AM	2	49	0
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#005 Manthey Road & Stewart Road - AM PEAK

LOCATION#:	005	QTD PROJ#:	090137
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009
EAST / WEST:	Stewart Road	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	4	5	0	0	10	0	0	0	1	0	0	0	20
7:15 AM	0	4	0	0	15	0	0	0	2	0	0	0	21
7:30 AM	2	12	0	0	22	0	1	0	0	0	0	0	37
7:45 AM	0	10	0	0	20	0	0	0	0	0	0	0	30
8:00 AM	0	12	0	0	17	0	0	0	0	0	0	0	29
8:15 AM	0	15	0	0	25	1	1	0	2	0	0	0	44
8:30 AM	2	2	0	0	18	0	0	0	0	0	0	0	22
8:45 AM	0	10	0	0	17	0	0	0	0	0	0	0	27
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	8	70	0	0	144	1	2	0	5	0	0	0	230
P.H.V: 1	2	49	0	0	84	1	2	0	2	0	0	0	140
P.H.F: 2		0.850			0.817			0.333			0.000		0.795

(1) Peak Hour Volume (Peak Hour Begins At 730 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#005 Manthey Road & Stewart Road - PM PEAK

LOCATION#:	005		QTD PROJ#:	090137
NORTH / SOUTH:	Manthey Road		DATE:	Wednesday, September 02, 2009
EAST / WEST:	Stewart Road		VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	1	20	0	0	16	1	0	0	0	0	0	0	38
4:15 PM	1	18	0	0	20	0	0	0	1	0	0	0	40
4:30 PM	1	12	0	0	7	0	0	0	0	0	0	0	20
4:45 PM	2	19	0	0	9	0	1	0	1	0	0	0	32
5:00 PM	3	23	0	0	13	0	0	0	0	0	0	0	39
5:15 PM	5	26	0	0	17	1	1	0	1	0	0	0	51
5:30 PM	2	17	0	0	14	0	1	0	2	0	0	0	36
5:45 PM	1	19	0	0	8	1	0	0	0	0	0	0	29
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	16	154	0	0	104	3	3	0	5	0	0	0	285
P.H.V: (1)	12	85	0	0	53	1	3	0	4	0	0	0	158
P.H.F: (2)		0.782			0.750			0.583			0.000		0.775

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#005 Manthey Road & Stewart Road

LOCATION#:	005	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Stewart Road	VICINITY:	Lathrop, CA	PM PEAK:	500 PM

1-WAY STOP (EB)

NORTH / WEST / EAST / SOUTH

Manthey Road – Southbound approach (north leg)

	Right	Through	Left
LN	0	1	0
AM	0	5	0
MD	0	0	0
PM	0	0	0
TOTAL	0	5	0

Manthey Road – Northbound departure (north leg)

TOTAL	11
PM	3
MD	0
AM	8

Stewart Road – Westbound departure (west leg)

TOTAL	PM	MD	AM
0	0	0	0

Stewart Road – Westbound approach (east leg)

Movement	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	0	0	0	0	0
Left	0	0	0	0	0

Stewart Road – Eastbound approach (west leg)

Movement	LN	AM	MD	PM	TOTAL
Left	0	0	0	0	0
Through	1	0	0	0	0
Right	0	0	0	0	0

Stewart Road – Eastbound departure (east leg)

AM	MD	PM	TOTAL
0	0	0	0

Manthey Road – Southbound departure (south leg)

AM	5
MD	0
PM	0
TOTAL	5

Manthey Road – Northbound approach (south leg)

	Left	Through	Right
TOTAL	0	11	0
PM	0	3	0
MD	0	0	0
AM	0	8	0
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	
MD COUNT	-	TO	-	
PM COUNT	4:00 PM	TO	6:00 PM	

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VEHICLE TURNING MOVEMENT COUNT

#005 Manthey Road & Stewart Road - AM PEAK

LOCATION#:	005	QTD PROJ#:	090137
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009
EAST / WEST:	Stewart Road	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
7:45 AM	0	1	0	0	2	0	0	0	0	0	0	0	3
8:00 AM	0	3	0	0	0	0	0	0	0	0	0	0	3
8:15 AM	0	4	0	0	1	0	0	0	0	0	0	0	5
8:30 AM	0	0	0	0	2	0	0	0	0	0	0	0	2
8:45 AM	0	2	0	0	0	0	0	0	0	0	0	0	2
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	12	0	0	5	0	0	0	0	0	0	0	17
P.H.V: 1	0	8	0	0	5	0	0	0	0	0	0	0	13
P.H.F: 2		0.500			0.625			0.000			0.000		0.650

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#005 Manthey Road & Stewart Road - PM PEAK

LOCATION#:	**005**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Stewart Road**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	3	0	0	1	0	0	0	0	0	0	0	4
P.H.V: [1]	0	3	0	0	0	0	0	0	0	0	0	0	3
P.H.F: [2]		0.750			0.000			0.000			0.000		0.750

(1) Peak Hour Volume (Peak Hour Begins At 500 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#006 Manthey Road & I-5 Underpass

LOCATION#:	006	QTD PROJ#:	090137	AM PEAK:	730 AM
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	I-5 Underpass	VICINITY:	Lathrop, CA	PM PEAK:	445 PM

Manthey Road – Southbound approach (north leg)

	Right	Through	Left
LN	0	1	0
AM	0	67	18
MD	0	0	0
PM	0	33	21
TOTAL	0	100	39

Manthey Road – Northbound departure (north leg)

TOTAL	149
PM	95
MD	0
AM	54

I-5 Underpass – Westbound departure (west leg)

TOTAL	PM	MD	AM
0	0	0	0

I-5 Underpass

I-5 Underpass – Eastbound approach (west leg)

LN	AM	MD	PM	TOTAL
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

NORTH

WEST **1-WAY STOP (WB)** EAST

SOUTH

I-5 Underpass – Westbound approach (east leg)

TOTAL	PM	MD	AM	LN
108	78	0	30	0
0	0	0	0	1
56	30	0	26	0

I-5 Underpass

I-5 Underpass – Eastbound departure (east leg)

AM	MD	PM	TOTAL
42	0	43	85

Manthey Road – Southbound departure (south leg)

AM	93
MD	0
PM	63
TOTAL	156

Manthey Road

Manthey Road – Northbound approach (south leg)

	Left	Through	Right
TOTAL	0	41	46
PM	0	17	22
MD	0	0	0
AM	0	24	24
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#006 Manthey Road & I-5 Underpass - AM PEAK

LOCATION#:	**006**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**I-5 Underpass**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	4	2	2	12	0	0	0	0	5	0	4	29
7:15 AM	0	2	5	4	13	0	0	0	0	6	0	1	31
7:30 AM	0	5	6	1	20	0	0	0	0	4	0	10	46
7:45 AM	0	5	6	3	18	0	0	0	0	8	0	6	46
8:00 AM	0	9	7	3	13	0	0	0	0	4	0	5	41
8:15 AM	0	5	5	11	16	0	0	0	0	10	0	9	56
8:30 AM	0	2	5	5	15	0	0	0	0	3	0	2	32
8:45 AM	0	6	1	4	14	0	0	0	0	8	0	6	39
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	38	37	33	121	0	0	0	0	48	0	43	320
P.H.V: 1	0	24	24	18	67	0	0	0	0	26	0	30	189
P.H.F: 2		0.750			0.787			0.000			0.737		0.844

(1) Peak Hour Volume (Peak Hour Begins At 730 AM)
(2) Peak Hour Factor (directional aggregate)

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Phone: 310-341-0019 Fax: 310-807-9247 Info@QualityTrafficData.com

VEHICLE TURNING MOVEMENT COUNT

#006 Manthey Road & I-5 Underpass - PM PEAK

LOCATION#: 006
NORTH / SOUTH: Manthey Road
EAST / WEST: I-5 Underpass

QTD PROJ#: 090137
DATE: Wednesday, September 02, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	5	4	8	6	0	0	0	0	7	0	15	45
4:15 PM	0	4	6	6	13	0	0	0	0	7	0	15	51
4:30 PM	0	3	7	2	6	0	0	0	0	7	0	13	38
4:45 PM	0	4	6	3	7	0	0	0	0	10	0	18	48
5:00 PM	0	5	6	4	7	0	0	0	0	3	0	20	45
5:15 PM	0	5	5	7	11	0	0	0	0	8	0	25	61
5:30 PM	0	3	5	7	8	0	0	0	0	9	0	15	47
5:45 PM	0	4	6	5	2	0	0	0	0	6	0	15	38
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	33	45	42	60	0	0	0	0	57	0	136	373
P.H.V: 1	0	17	22	21	33	0	0	0	0	30	0	78	201
P.H.F: 2		0.886			0.750			0.000			0.818		0.824

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#006 Manthey Road & I-5 Underpass

LOCATION#:	006	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	I-5 Underpass	VICINITY:	Lathrop, CA	PM PEAK:	515 PM

1-WAY STOP (WB)

Manthey Road – Southbound approach (north leg)

	Right	Through	Left
LN	0	1	0
AM	0	6	1
MD	0	0	0
PM	0	0	1
TOTAL	0	6	2

Manthey Road – Northbound departure (north leg)

AM	MD	PM	TOTAL
9	0	1	10

I-5 Underpass – Westbound departure (west leg)

TOTAL	PM	MD	AM
0	0	0	0

I-5 Underpass – Westbound approach (east leg)

Movement	TOTAL	PM	MD	AM	LN
Right	3	1	0	2	0
Through	0	0	0	0	1
Left	11	3	0	8	0

I-5 Underpass – Eastbound approach (west leg)

Movement	LN	AM	MD	PM	TOTAL
Left	0	0	0	0	0
Through	0	0	0	0	0
Right	0	0	0	0	0

I-5 Underpass – Eastbound departure (east leg)

AM	MD	PM	TOTAL
4	0	4	8

Manthey Road – Southbound departure (south leg)

AM	MD	PM	TOTAL
14	0	3	17

Manthey Road – Northbound approach (south leg)

	Left	Through	Right
TOTAL	0	7	6
PM	0	0	3
MD	0	0	0
AM	0	7	3
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#006 Manthey Road & I-5 Underpass - AM PEAK

LOCATION#:	006	QTD PROJ#:	090137
NORTH / SOUTH:	Manthey Road	DATE:	Wednesday, September 02, 2009
EAST / WEST:	I-5 Underpass	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	0	0	1	0	0	0	0	1	0	0	2
7:15 AM	0	0	1	0	0	0	0	0	0	2	0	0	3
7:30 AM	0	1	2	0	0	0	0	0	0	2	0	1	6
7:45 AM	0	1	1	1	1	0	0	0	0	4	0	0	8
8:00 AM	0	4	1	0	0	0	0	0	0	2	0	0	7
8:15 AM	0	2	0	0	1	0	0	0	0	1	0	2	6
8:30 AM	0	0	1	0	4	0	0	0	0	1	0	0	6
8:45 AM	0	2	0	0	0	0	0	0	0	4	0	1	7
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	10	6	1	7	0	0	0	0	17	0	4	45
P.H.V: (1)	0	7	3	1	6	0	0	0	0	8	0	2	27
P.H.F: (2)		0.500			0.438			0.000			0.625		0.844

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#006 Manthey Road & I-5 Underpass - PM PEAK

LOCATION#:	**006**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**I-5 Underpass**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	3	0	0	3
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
5:15 PM	0	0	1	0	0	0	0	0	0	2	0	1	4
5:30 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	1	1	0	0	0	0	0	1	0	0	3
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	4	1	0	0	0	0	0	7	0	1	13
P.H.V: (1)	0	0	3	1	0	0	0	0	0	3	0	1	8
P.H.F: (2)		0.750			0.250			0.000			0.333		0.500

(1) Peak Hour Volume (Peak Hour Begins At 515 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#007 Manthey Road & I-5 SB Ramps

LOCATION#:	007	QTD PROJ#:	090137	AM PEAK:	730 AM
NORTH / SOUTH:	Manthey Road	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-5 SB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	445 PM

Manthey Road (North leg, southbound approach)

LN	0	1	0
AM	0	14	81
MD	0	0	0
PM	0	13	52
TOTAL	0	27	133

Manthey Road (North leg, northbound departure)

TOTAL	83
PM	34
MD	0
AM	49

I-5 SB Ramps (West leg, westbound departure)

TOTAL	PM	MD	AM
0	0	0	0

I-5 SB Ramps

I-5 SB Ramps (East leg, westbound approach)

TOTAL	PM	MD	AM	LN
62	24	0	38	0
0	0	0	0	1
6	2	0	4	0

NORTH

WEST **1-WAY STOP (WB)** EAST

SOUTH

I-5 SB Ramps (West leg, eastbound approach)

LN	AM	MD	PM	TOTAL
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

I-5 SB Ramps

I-5 SB Ramps (East leg, eastbound departure)

AM	MD	PM	TOTAL
112	0	53	165

Manthey Road (South leg, southbound departure)

AM	18
MD	0
PM	15
TOTAL	33

Manthey Road

Manthey Road (South leg, northbound approach)

TOTAL	0	21	32
PM	0	10	1
MD	0	0	0
AM	0	11	31
LN	0	1	0

AM COUNT 7:00 AM TO 9:00 AM **MD COUNT** - TO - **PM COUNT** 4:00 PM TO 6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#007 Manthey Road & I-5 SB Ramps - AM PEAK

LOCATION#:	007	QTD PROJ#:	090137
NORTH / SOUTH:	Manthey Road	DATE:	Thursday, September 03, 2009
EAST / WEST:	I-5 SB Ramps	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	1	6	12	7	0	0	0	0	2	0	6	34
7:15 AM	0	1	5	18	1	0	0	0	0	6	0	8	39
7:30 AM	0	1	7	24	1	0	0	0	0	1	0	11	45
7:45 AM	0	1	8	20	6	0	0	0	0	1	0	11	47
8:00 AM	0	6	5	14	4	0	0	0	0	0	0	9	38
8:15 AM	0	3	11	23	3	0	0	0	0	2	0	7	49
8:30 AM	0	1	6	16	2	0	0	0	0	1	0	5	31
8:45 AM	0	0	9	13	9	0	0	0	0	0	0	8	39
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	14	57	140	33	0	0	0	0	13	0	65	322
P.H.V: (1)	0	11	31	81	14	0	0	0	0	4	0	38	179
P.H.F: (2)		0.750			0.913			0.000			0.875		0.913

(1) Peak Hour Volume (Peak Hour Begins At 730 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#007 Manthey Road & I-5 SB Ramps - PM PEAK

LOCATION#:	**007**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-5 SB Ramps**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	1	0	12	0	0	0	0	0	0	0	7	20
4:15 PM	0	5	0	15	4	0	0	0	0	0	0	3	27
4:30 PM	0	2	0	12	1	0	0	0	0	0	0	8	23
4:45 PM	0	2	1	12	5	0	0	0	0	0	0	6	26
5:00 PM	0	4	0	10	1	0	0	0	0	1	0	7	23
5:15 PM	0	2	0	15	4	0	0	0	0	1	0	6	28
5:30 PM	0	2	0	15	3	0	0	0	0	0	0	5	25
5:45 PM	0	5	0	9	0	0	0	0	0	0	0	4	18
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	23	1	100	18	0	0	0	0	2	0	46	190
P.H.V: 1	0	10	1	52	13	0	0	0	0	2	0	24	102
P.H.F: 2		0.688			0.855			0.000			0.813		0.911

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#007 Manthey Road & I-5 SB Ramps

LOCATION#:	007	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	Manthey Road	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-5 SB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	500 PM

Manthey Road (North leg) – Southbound approach

	Right	Through	Left
LN	0	1	0
AM	0	6	6
MD	0	0	0
PM	0	0	3
TOTAL	0	6	9

Manthey Road (North leg) – Northbound departure

TOTAL	14
PM	3
MD	0
AM	11

I-5 SB Ramps (West leg) – Westbound departure

TOTAL	PM	MD	AM
0	0	0	0

I-5 SB Ramps (West leg) – Eastbound approach

LN	AM	MD	PM	TOTAL
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

NORTH

WEST **1-WAY STOP (WB)** EAST

SOUTH

I-5 SB Ramps (East leg) – Westbound approach

TOTAL	PM	MD	AM	LN
10	2	0	8	0
0	0	0	0	1
7	1	0	6	0

I-5 SB Ramps (East leg) – Eastbound departure

AM	MD	PM	TOTAL
29	0	3	32

Manthey Road (South leg) – Southbound departure

AM	12
MD	0
PM	1
TOTAL	13

Manthey Road (South leg) – Northbound approach

	Left	Through	Right
TOTAL	0	4	23
PM	0	1	0
MD	0	0	0
AM	0	3	23
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	
MD COUNT	-	TO	-	
PM COUNT	4:00 PM	TO	6:00 PM	

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#007 Manthey Road & I-5 SB Ramps - AM PEAK

LOCATION#:	007		QTD PROJ#:	090137
NORTH / SOUTH:	Manthey Road		DATE:	Thursday, September 03, 2009
EAST / WEST:	I-5 SB Ramps		VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	0	2	1	2	0	0	0	0	1	0	0	6
7:15 AM	0	0	5	2	0	0	0	0	0	5	0	1	13
7:30 AM	0	0	7	1	1	0	0	0	0	1	0	3	13
7:45 AM	0	0	7	1	4	0	0	0	0	0	0	2	14
8:00 AM	0	3	4	2	1	0	0	0	0	0	0	2	12
8:15 AM	0	2	7	2	0	0	0	0	0	1	0	0	12
8:30 AM	0	0	6	4	1	0	0	0	0	0	0	0	11
8:45 AM	0	0	9	0	4	0	0	0	0	0	0	2	15
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	5	47	13	13	0	0	0	0	8	0	10	96
P.H.V: 1	0	3	23	6	6	0	0	0	0	6	0	8	52
P.H.F: 2		0.929			0.600			0.000			0.583		0.929

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#007 Manthey Road & I-5 SB Ramps - PM PEAK

LOCATION#:	**007**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Manthey Road**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-5 SB Ramps**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	0	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	1
5:00 PM	0	0	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	0	1	0	1	0	0	0	0	0	1	0	0	3
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	1
5:45 PM	0	0	0	1	0	0	0	0	0	0	0	1	2
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	1	0	4	0	0	0	0	0	1	0	3	9
P.H.V: [1]	0	1	0	3	0	0	0	0	0	1	0	2	7
P.H.F: [2]		0.250			0.750			0.000			0.750		0.583

(1) Peak Hour Volume (Peak Hour Begins At 500 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#008 Mossdale Road & I-5 NB Ramps

LOCATION#:	008	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	Mossdale Road	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-5 NB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	445 PM

1-WAY STOP (EB)

NORTH / SOUTH / EAST / WEST

Mossdale Road – Southbound approach (north leg)

	Right	Through	Left
LN	0	1	0
AM	15	13	0
MD	0	0	0
PM	48	19	0
TOTAL	63	32	0

Mossdale Road – Northbound departure (north leg)

TOTAL	98
PM	66
MD	0
AM	32

I-5 NB Ramps – Westbound departure (west leg)

TOTAL	PM	MD	AM
122	79	0	43

I-5 NB Ramps – Westbound approach (east leg)

	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	0	0	0	0	0
Left	0	0	0	0	0

I-5 NB Ramps – Eastbound approach (west leg)

	LN	AM	MD	PM	TOTAL
Left	0	22	0	47	69
Through	1	0	0	0	0
Right	0	29	0	83	112

I-5 NB Ramps – Eastbound departure (east leg)

AM	MD	PM	TOTAL
0	0	0	0

Mossdale Road – Southbound departure (south leg)

AM	42
MD	0
PM	102
TOTAL	144

Mossdale Road – Northbound approach (south leg)

	Left	Through	Right
TOTAL	59	29	0
PM	31	19	0
MD	0	0	0
AM	28	10	0
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#008 Mossdale Road & I-5 NB Ramps - AM PEAK

LOCATION#:	008	QTD PROJ#:	090137
NORTH / SOUTH:	Mossdale Road	DATE:	Thursday, September 03, 2009
EAST / WEST:	I-5 NB Ramps	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	1	1	0	0	0	1	1	0	1	0	0	0	5
7:15 AM	5	2	0	0	3	3	5	0	5	0	0	0	23
7:30 AM	1	4	0	0	6	5	4	0	9	0	0	0	29
7:45 AM	6	3	0	0	3	4	8	0	7	0	0	0	31
8:00 AM	4	1	0	0	4	5	4	0	8	0	0	0	26
8:15 AM	6	3	0	0	3	4	4	0	5	0	0	0	25
8:30 AM	12	3	0	0	3	2	6	0	9	0	0	0	35
8:45 AM	6	1	0	0	0	5	4	0	10	0	0	0	26
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	41	18	0	0	22	29	36	0	54	0	0	0	200
P.H.V: 1	28	10	0	0	13	15	22	0	29	0	0	0	117
P.H.F: 2		0.633			0.778			0.850			0.000		0.836

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#008 Mossdale Road & I-5 NB Ramps - PM PEAK

LOCATION#:	**008**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Mossdale Road**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-5 NB Ramps**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	14	9	0	0	7	6	6	0	14	0	0	0	56
4:15 PM	10	4	0	0	4	14	15	0	16	0	0	0	63
4:30 PM	7	6	0	0	5	10	7	0	18	0	0	0	53
4:45 PM	5	4	0	0	5	11	10	0	22	0	0	0	57
5:00 PM	7	7	0	0	6	13	12	0	19	0	0	0	64
5:15 PM	10	4	0	0	5	15	12	0	18	0	0	0	64
5:30 PM	9	4	0	0	3	9	13	0	24	0	0	0	62
5:45 PM	7	2	0	0	2	7	6	0	12	0	0	0	36
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	69	40	0	0	37	85	81	0	143	0	0	0	455
P.H.V: [1]	31	19	0	0	19	48	47	0	83	0	0	0	247
P.H.F: [2]		0.893			0.838			0.878			0.000		0.965

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#008 Mossdale Road & I-5 NB Ramps

LOCATION#:	008	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	Mossdale Road	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-5 NB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	500 PM

Mossdale Road (north leg, southbound approach)

LN	0	1	0
AM	0	4	0
MD	0	0	0
PM	2	1	0
TOTAL	2	5	0

Mossdale Road (north leg, northbound departure)

TOTAL	PM	MD	AM
10	3	0	7

I-5 NB Ramps (west leg, westbound departure)

TOTAL	PM	MD	AM
6	3	0	3

I-5 NB Ramps (west leg, eastbound approach)

LN	AM	MD	PM	TOTAL
0	6	0	2	8
1	0	0	0	0
0	5	0	4	9

NORTH

WEST **1-WAY STOP (EB)** EAST

SOUTH

I-5 NB Ramps (east leg, westbound approach)

TOTAL	PM	MD	AM	LN
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

I-5 NB Ramps (east leg, eastbound departure)

AM	MD	PM	TOTAL
0	0	0	0

Mossdale Road (south leg, southbound departure)

AM	MD	PM	TOTAL
9	0	5	14

Mossdale Road (south leg, northbound approach)

TOTAL	4	2	0
PM	1	1	0
MD	0	0	0
AM	3	1	0
LN	0	1	0

AM COUNT 7:00 AM TO 9:00 AM **MD COUNT** - TO - **PM COUNT** 4:00 PM TO 6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#008 Mossdale Road & I-5 NB Ramps - AM PEAK

LOCATION#:	008	QTD PROJ#:	090137
NORTH / SOUTH:	Mossdale Road	DATE:	Thursday, September 03, 2009
EAST / WEST:	I-5 NB Ramps	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	1	0	0	0	0	1	1	0	1	0	0	0	4
7:15 AM	1	0	0	0	0	0	1	0	0	0	0	0	2
7:30 AM	1	1	0	0	2	0	0	0	2	0	0	0	6
7:45 AM	0	0	0	0	1	0	2	0	1	0	0	0	4
8:00 AM	0	0	0	0	2	0	1	0	1	0	0	0	4
8:15 AM	2	1	0	0	0	0	0	0	2	0	0	0	5
8:30 AM	1	0	0	0	1	0	3	0	1	0	0	0	6
8:45 AM	0	0	0	0	0	0	0	0	3	0	0	0	3
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	6	2	0	0	6	1	8	0	11	0	0	0	34
P.H.V: 1	3	1	0	0	4	0	6	0	5	0	0	0	19
P.H.F: 2		0.333			0.500			0.688			0.000		0.792

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#008 Mossdale Road & I-5 NB Ramps - PM PEAK

LOCATION#: 008
NORTH / SOUTH: Mossdale Road
EAST / WEST: I-5 NB Ramps

QTD PROJ#: 090137
DATE: Thursday, September 03, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	1	0	0	0	0	0	0	0	2	0	0	0	3
4:15 PM	1	0	0	0	0	0	0	0	2	0	0	0	3
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	2	0	0	0	2
5:00 PM	0	1	0	0	1	0	0	0	2	0	0	0	4
5:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	1
5:30 PM	0	0	0	0	0	2	2	0	0	0	0	0	4
5:45 PM	1	0	0	0	0	0	0	0	1	0	0	0	2
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	3	1	0	0	1	2	2	0	10	0	0	0	19
P.H.V: 1	1	1	0	0	1	2	2	0	4	0	0	0	11
P.H.F: 2		0.500			0.375			0.750			0.000		0.688

(1) Peak Hour Volume (Peak Hour Begins At 500 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#009 McArthur Drive & I-205 EB Ramps

LOCATION#:	009	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	McArthur Drive	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-205 EB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

McArthur Drive (southbound approach)

LN	0	1	1
AM	0	259	20
MD	0	0	0
PM	0	250	60
TOTAL	0	509	80

McArthur Drive (northbound departure)

TOTAL	442
PM	261
MD	0
AM	181

I-205 EB Ramps (westbound departure)

TOTAL	PM	MD	AM
0	0	0	0

I-205 EB Ramps (westbound approach)

TOTAL	PM	MD	AM	LN
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

NORTH

WEST **SIGNALIZED** EAST

SOUTH

I-205 EB Ramps (eastbound approach)

LN	AM	MD	PM	TOTAL
0	15	0	23	38
1	3	0	1	4
0	162	0	182	344

I-205 EB Ramps (eastbound departure)

AM	MD	PM	TOTAL
261	0	426	687

McArthur Drive (southbound departure)

AM	421
MD	0
PM	432
TOTAL	853

McArthur Drive (northbound approach)

TOTAL	0	404	603
PM	0	238	365
MD	0	0	0
AM	0	166	238
LN	0	1	1

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#009 McArthur Drive & I-205 EB Ramps - AM PEAK

LOCATION#:	009	QTD PROJ#:	090137
NORTH / SOUTH:	McArthur Drive	DATE:	Thursday, September 03, 2009
EAST / WEST:	I-205 EB Ramps	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	1	1	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	27	42	1	29	0	0	0	17	0	0	0	116
7:15 AM	0	39	57	10	48	0	4	2	40	0	0	0	200
7:30 AM	0	38	66	3	69	0	2	0	33	0	0	0	211
7:45 AM	0	41	59	4	82	0	4	1	51	0	0	0	242
8:00 AM	0	48	56	3	60	0	5	0	38	0	0	0	210
8:15 AM	0	38	47	3	54	0	3	0	34	0	0	0	179
8:30 AM	0	41	45	7	63	0	3	1	39	0	0	0	199
8:45 AM	0	41	31	4	45	0	3	1	26	0	0	0	151
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	313	403	35	450	0	24	5	278	0	0	0	1508
P.H.V: 1	0	166	238	20	259	0	15	3	162	0	0	0	863
P.H.F: 2		0.971			0.811			0.804			0.000		0.892

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#009 McArthur Drive & I-205 EB Ramps - PM PEAK

LOCATION#:	**009**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**		**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-205 EB Ramps**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	1	1	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	46	73	18	64	0	5	0	39	0	0	0	245
4:15 PM	0	59	93	7	66	0	7	1	43	0	0	0	276
4:30 PM	0	54	94	19	65	0	5	0	51	0	0	0	288
4:45 PM	0	54	77	11	78	0	6	0	46	0	0	0	272
5:00 PM	0	71	101	23	41	0	5	0	42	0	0	0	283
5:15 PM	0	50	73	13	35	0	3	2	44	0	0	0	220
5:30 PM	0	51	63	12	61	0	4	0	32	0	0	0	223
5:45 PM	0	29	28	4	67	0	1	0	27	0	0	0	156
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	414	602	107	477	0	36	3	324	0	0	0	1963
P.H.V: 1	0	238	365	60	250	0	23	1	182	0	0	0	1119
P.H.F: 2		0.876			0.871			0.920			0.000		0.971

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#009 McArthur Drive & I-205 EB Ramps

LOCATION#:	009	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	McArthur Drive	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-205 EB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	400 PM

McArthur Drive – North leg (southbound approach)

LN	0	1	1
AM	0	33	8
MD	0	0	0
PM	0	30	6
TOTAL	0	63	14

McArthur Drive – North leg (northbound departure)

TOTAL	85
PM	25
MD	0
AM	60

I-205 EB Ramps – West leg (westbound departure)

TOTAL	PM	MD	AM
0	0	0	0

I-205 EB Ramps

I-205 EB Ramps – West leg (eastbound approach)

LN	AM	MD	PM	TOTAL
0	6	0	1	7
1	1	0	0	1
0	46	0	47	93

NORTH

WEST **SIGNALIZED** EAST

SOUTH

I-205 EB Ramps – East leg (westbound approach)

TOTAL	PM	MD	AM	LN
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

I-205 EB Ramps

I-205 EB Ramps – East leg (eastbound departure)

AM	MD	PM	TOTAL
63	0	38	101

McArthur Drive – South leg (southbound departure)

AM	79
MD	0
PM	77
TOTAL	156

McArthur Drive – South leg (northbound approach)

TOTAL	0	78	86
PM	0	24	32
MD	0	0	0
AM	0	54	54
LN	0	1	1

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#009 McArthur Drive & I-205 EB Ramps - AM PEAK

LOCATION#:	009	QTD PROJ#:	090137
NORTH / SOUTH:	McArthur Drive	DATE:	Thursday, September 03, 2009
EAST / WEST:	I-205 EB Ramps	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	1	1	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	11	7	1	11	0	0	0	8	0	0	0	38
7:15 AM	0	17	8	2	6	0	0	2	8	0	0	0	43
7:30 AM	0	7	10	0	9	0	0	0	8	0	0	0	34
7:45 AM	0	14	16	2	9	0	2	1	10	0	0	0	54
8:00 AM	0	14	13	1	9	0	1	0	11	0	0	0	49
8:15 AM	0	11	15	1	8	0	1	0	10	0	0	0	46
8:30 AM	0	15	10	4	7	0	2	0	15	0	0	0	53
8:45 AM	0	10	7	1	7	0	1	1	5	0	0	0	32
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	99	86	12	66	0	7	4	75	0	0	0	349
P.H.V: 1	0	54	54	8	33	0	6	1	46	0	0	0	202
P.H.F: 2		0.900			0.932			0.779			0.000		0.935

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#009 McArthur Drive & I-205 EB Ramps - PM PEAK

LOCATION#: 009
NORTH / SOUTH: McArthur Drive
EAST / WEST: I-205 EB Ramps

QTD PROJ#: 090137
DATE: Thursday, September 03, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	1	1	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	5	9	2	2	0	0	0	14	0	0	0	32
4:15 PM	0	8	8	1	6	0	0	0	14	0	0	0	37
4:30 PM	0	5	8	2	10	0	0	0	11	0	0	0	36
4:45 PM	0	6	7	1	12	0	1	0	8	0	0	0	35
5:00 PM	0	4	8	1	5	0	0	0	9	0	0	0	27
5:15 PM	0	5	8	0	3	0	1	2	2	0	0	0	21
5:30 PM	0	3	4	0	6	0	0	0	6	0	0	0	19
5:45 PM	0	6	4	0	14	0	0	0	1	0	0	0	25
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	42	56	7	58	0	2	2	65	0	0	0	232
P.H.V: 1	0	24	32	6	30	0	1	0	47	0	0	0	140
P.H.F: 2		0.875			0.692			0.857			0.000		0.946

(1) Peak Hour Volume (Peak Hour Begins At 400 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#010 McArthur Drive & I-205 WB Ramps

LOCATION#:	010	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	McArthur Drive	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-205 WB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

SIGNALIZED (NORTH / SOUTH / EAST / WEST)

McArthur Drive – North leg, southbound approach

	Right (to West)	Through	Left (to East)
LN	0	1	0
AM	7	46	0
MD	0	0	0
PM	17	99	0
TOTAL	24	145	0

McArthur Drive – North leg, northbound departure

TOTAL	167
PM	75
MD	0
AM	92

I-205 WB Ramps – West leg, westbound departure

TOTAL	PM	MD	AM
379	227	0	152

I-205 WB Ramps – West leg, eastbound approach

	LN	AM	MD	PM	TOTAL
Left	0	0	0	0	0
Through	0	0	0	0	0
Right	0	0	0	0	0

I-205 WB Ramps – East leg, westbound approach

	TOTAL	PM	MD	AM	LN
Right	72	21	0	51	0
Through	8	3	0	5	1
Left	444	211	0	233	0

I-205 WB Ramps – East leg, eastbound departure

AM	MD	PM	TOTAL
0	0	0	0

McArthur Drive – South leg, southbound departure

AM	279
MD	0
PM	310
TOTAL	589

McArthur Drive – South leg, northbound approach

	Left	Through	Right
TOTAL	347	95	0
PM	207	54	0
MD	0	0	0
AM	140	41	0
LN	1	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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Phone: 310-341-0019 Fax: 310-807-9247 Info@QualityTrafficData.com

VEHICLE TURNING MOVEMENT COUNT

#010 McArthur Drive & I-205 WB Ramps - AM PEAK

LOCATION#:	**010**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**		**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-205 WB Ramps**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	1	1	0	0	1	0	0	0	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	22	5	0	0	1	0	0	0	0	29	1	7	65
7:15 AM	36	7	0	0	13	1	0	0	0	45	1	14	117
7:30 AM	32	8	0	0	10	1	0	0	0	62	2	14	129
7:45 AM	34	11	0	0	16	5	0	0	0	70	0	12	148
8:00 AM	38	15	0	0	7	0	0	0	0	56	2	11	129
8:15 AM	33	8	0	0	7	0	0	0	0	50	3	9	110
8:30 AM	37	7	0	0	11	1	0	0	0	59	2	9	126
8:45 AM	34	10	0	0	8	5	0	0	0	41	0	1	99
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	266	71	0	0	73	13	0	0	0	412	11	77	923
P.H.V: (1)	140	41	0	0	46	7	0	0	0	233	5	51	523
P.H.F: (2)		0.854			0.631			0.000			0.881		0.883

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#010 McArthur Drive & I-205 WB Ramps - PM PEAK

LOCATION#:	010	QTD PROJ#:	090137
NORTH / SOUTH:	McArthur Drive	DATE:	Thursday, September 03, 2009
EAST / WEST:	I-205 WB Ramps	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	1	1	0	0	1	0	0	0	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	38	13	0	0	29	3	0	0	0	53	0	3	139
4:15 PM	50	16	0	0	22	6	0	0	0	51	1	5	151
4:30 PM	48	11	0	0	30	3	0	0	0	54	0	5	151
4:45 PM	49	11	0	0	23	2	0	0	0	66	2	6	159
5:00 PM	60	16	0	0	24	6	0	0	0	40	0	5	151
5:15 PM	47	6	0	0	27	0	0	0	0	21	0	1	102
5:30 PM	47	8	0	0	21	4	0	0	0	52	1	3	136
5:45 PM	20	10	0	0	16	1	0	0	0	55	0	5	107
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	359	91	0	0	192	25	0	0	0	392	4	33	1096
P.H.V: 1	207	54	0	0	99	17	0	0	0	211	3	21	612
P.H.F: 2		0.859			0.879			0.000			0.794		0.962

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#010 McArthur Drive & I-205 WB Ramps

LOCATION#:	010	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	McArthur Drive	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-205 WB Ramps	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

McArthur Drive (north leg)

LN	0	1	0
AM	1	9	0
MD	0	0	0
PM	1	10	0
TOTAL	2	19	0

TOTAL	PM	MD	AM
24	9	0	15

I-205 WB Ramps (west leg)

TOTAL	PM	MD	AM
77	21	0	56

LN	AM	MD	PM	TOTAL
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

I-205 WB Ramps (east leg)

TOTAL	PM	MD	AM	LN
9	3	0	6	0
6	2	0	4	1
60	28	0	32	0

AM	MD	PM	TOTAL
0	0	0	0

NORTH

WEST **SIGNALIZED** EAST

SOUTH

McArthur Drive (south leg)

AM	MD	PM	TOTAL
41	0	38	79

TOTAL	69	15	0
PM	18	6	0
MD	0	0	0
AM	51	9	0
LN	1	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS) (TRUCKS)

#010 McArthur Drive & I-205 WB Ramps - AM PEAK

LOCATION#:	**010**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-205 WB Ramps**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	1	1	0	0	1	0	0	0	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	10	1	0	0	1	0	0	0	0	11	1	1	25
7:15 AM	16	1	0	0	3	0	0	0	0	5	0	5	30
7:30 AM	6	1	0	0	1	0	0	0	0	8	2	2	20
7:45 AM	13	3	0	0	4	0	0	0	0	7	0	1	28
8:00 AM	13	2	0	0	2	0	0	0	0	8	2	2	29
8:15 AM	10	2	0	0	0	0	0	0	0	9	0	1	22
8:30 AM	15	2	0	0	3	1	0	0	0	8	2	2	33
8:45 AM	9	2	0	0	0	0	0	0	0	8	0	0	19
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	92	14	0	0	14	1	0	0	0	64	7	14	206
P.H.V: 1	51	9	0	0	9	1	0	0	0	32	4	6	112
P.H.F: 2		0.882			0.625			0.000			0.875		0.848

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS) (TRUCKS)

#010 McArthur Drive & I-205 WB Ramps - PM PEAK

LOCATION#:	**010**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-205 WB Ramps**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	1	1	0	0	1	0	0	0	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	5	0	0	0	0	0	0	0	0	4	0	0	9
4:15 PM	6	2	0	0	2	1	0	0	0	5	1	2	19
4:30 PM	5	0	0	0	4	0	0	0	0	8	0	0	17
4:45 PM	5	2	0	0	3	0	0	0	0	10	1	1	22
5:00 PM	2	2	0	0	1	0	0	0	0	5	0	0	10
5:15 PM	6	0	0	0	1	0	0	0	0	2	0	0	9
5:30 PM	3	0	0	0	2	0	0	0	0	4	1	1	11
5:45 PM	5	1	0	0	1	0	0	0	0	13	0	1	21
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	37	7	0	0	14	1	0	0	0	51	3	5	118
P.H.V: (1)	18	6	0	0	10	1	0	0	0	28	2	3	68
P.H.F: (2)		0.750			0.688			0.000			0.688		0.773

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#011 McArthur Drive & Arbor Avenue

LOCATION#:	011	QTD PROJ#:	090137	AM PEAK:	730 AM
NORTH / SOUTH:	McArthur Drive	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Arbor Avenue	VICINITY:	Lathrop, CA	PM PEAK:	430 PM

McArthur Drive – Southbound approach (north leg)

	Right	Through	Left
LN	0	1	0
AM	8	17	2
MD	0	0	0
PM	13	29	4
TOTAL	21	46	6

McArthur Drive – Northbound departure (north leg)

TOTAL	86
PM	42
MD	0
AM	44

Arbor Avenue – Westbound departure (west leg)

TOTAL	PM	MD	AM
144	50	0	94

Arbor Avenue – Westbound approach (east leg)

	TOTAL	PM	MD	AM	LN
Right	7	4	0	3	0
Through	39	11	0	28	1
Left	14	9	0	5	0

NORTH

WEST **4-WAY STOP** EAST

SOUTH

Arbor Avenue – Eastbound approach (west leg)

	LN	AM	MD	PM	TOTAL
Left	0	15	0	16	31
Through	1	11	0	25	36
Right	0	19	0	78	97

Arbor Avenue – Eastbound departure (east leg)

AM	MD	PM	TOTAL
21	0	43	64

McArthur Drive – Southbound departure (south leg)

AM	41
MD	0
PM	116
TOTAL	157

McArthur Drive – Northbound approach (south leg)

	Left	Through	Right
TOTAL	84	48	22
PM	26	22	14
MD	0	0	0
AM	58	26	8
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#011 McArthur Drive & Arbor Avenue - AM PEAK

LOCATION#:	**011**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**		**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Arbor Avenue**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	8	4	2	0	2	1	1	1	2	0	2	1	24
7:15 AM	16	4	2	0	4	2	0	2	9	1	3	0	43
7:30 AM	17	4	3	0	4	1	4	4	5	2	5	0	49
7:45 AM	19	5	0	0	8	3	0	0	6	2	10	2	55
8:00 AM	14	10	2	2	3	2	6	3	3	1	6	0	52
8:15 AM	8	7	3	0	2	2	5	4	5	0	7	1	44
8:30 AM	8	9	2	0	8	1	4	2	4	0	2	0	40
8:45 AM	3	6	1	0	5	2	3	4	4	3	4	1	36
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	93	49	15	2	36	14	23	20	38	9	39	5	343
P.H.V: 1	58	26	8	2	17	8	15	11	19	5	28	3	200
P.H.F: 2		0.885			0.614			0.804			0.643		0.909

(1) Peak Hour Volume (Peak Hour Begins At 730 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#011 McArthur Drive & Arbor Avenue - PM PEAK

LOCATION#:	**011**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**		**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Arbor Avenue**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	3	4	2	3	3	1	0	5	28	1	4	1	55
4:15 PM	4	7	4	2	9	0	3	0	20	1	4	0	54
4:30 PM	7	9	4	1	7	3	2	6	26	2	3	1	71
4:45 PM	8	4	2	2	9	5	3	7	16	2	1	1	60
5:00 PM	7	4	5	1	5	1	5	5	20	2	5	0	60
5:15 PM	4	5	3	0	8	4	6	7	16	3	2	2	60
5:30 PM	7	3	2	3	10	2	1	9	13	2	7	2	61
5:45 PM	6	6	4	0	6	1	3	6	10	2	7	1	52
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	46	42	26	12	57	17	23	45	149	15	33	8	473
P.H.V: 1	26	22	14	4	29	13	16	25	78	9	11	4	251
P.H.F: 2		0.775			0.719			0.875			0.857		0.884

(1) Peak Hour Volume (Peak Hour Begins At 430 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#011 McArthur Drive & Arbor Avenue

LOCATION#:	011	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	McArthur Drive	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Arbor Avenue	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

McArthur Drive – North leg (southbound approach)

	Right	Through	Left
LN	0	1	0
AM	0	1	0
MD	0	0	0
PM	1	5	1
TOTAL	1	6	1

McArthur Drive – North leg (northbound departure)

TOTAL	PM	MD	AM
4	3	0	1

Arbor Avenue – West leg (westbound departure)

TOTAL	PM	MD	AM
18	6	0	12

Arbor Avenue – East leg (westbound approach)

	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	0	0	0	0	1
Left	4	2	0	2	0

NORTH

WEST **4-WAY STOP** EAST

SOUTH

Arbor Avenue – West leg (eastbound approach)

	LN	AM	MD	PM	TOTAL
Left	0	0	0	1	1
Through	1	1	0	1	2
Right	0	5	0	4	9

Arbor Avenue – East leg (eastbound departure)

AM	MD	PM	TOTAL
4	0	3	7

McArthur Drive – South leg (southbound departure)

AM	MD	PM	TOTAL
8	0	11	19

McArthur Drive – South leg (northbound approach)

	Left	Through	Right
TOTAL	17	3	4
PM	5	2	1
MD	0	0	0
AM	12	1	3
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#011 McArthur Drive & Arbor Avenue - AM PEAK

LOCATION#:	**011**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**		**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Arbor Avenue**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	1	1	0	0	1	0	0	0	1	0	0	0	4
7:15 AM	4	0	2	0	1	0	0	0	1	1	0	0	9
7:30 AM	1	0	1	0	0	0	0	1	1	0	0	0	4
7:45 AM	4	0	0	0	0	0	0	0	2	0	0	0	6
8:00 AM	3	1	0	0	0	0	0	0	1	1	0	0	6
8:15 AM	3	1	0	0	0	0	0	0	0	0	0	0	4
8:30 AM	1	1	1	0	2	0	0	0	2	0	0	0	7
8:45 AM	1	1	0	0	0	0	0	0	0	0	0	0	2
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	18	5	4	0	4	0	0	1	8	2	0	0	42
P.H.V: (1)	12	1	3	0	1	0	0	1	5	2	0	0	25
P.H.F: (2)		0.667			0.250			0.750			0.500		0.694

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#011 McArthur Drive & Arbor Avenue - PM PEAK

LOCATION#:	**011**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**McArthur Drive**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Arbor Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	1	1	1	0	0	0	0	0	1	0	0	0	4
4:30 PM	0	1	0	0	3	0	0	1	3	0	0	0	8
4:45 PM	2	0	0	0	2	0	1	0	0	1	0	0	6
5:00 PM	2	0	0	1	0	1	0	0	0	1	0	0	5
5:15 PM	0	0	0	0	0	0	1	0	1	0	0	0	2
5:30 PM	1	1	0	0	0	0	0	0	2	0	0	0	4
5:45 PM	1	0	0	0	0	0	1	0	1	0	0	0	3
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	7	3	1	1	5	1	3	1	8	2	0	0	32
P.H.V: 1	5	2	1	1	5	1	1	1	4	2	0	0	23
P.H.F: 2		0.667			0.583			0.375			0.500		0.719

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#012 Paradise Road & Arbor Avenue

LOCATION#:	012	QTD PROJ#:	090137	AM PEAK:	730 AM
NORTH / SOUTH:	Paradise Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Arbor Avenue	VICINITY:	Lathrop, CA	PM PEAK:	445 PM

Paradise Road – Southbound approach (north leg)

	Right	Through	Left
LN	0	1	0
AM	14	10	0
MD	0	0	0
PM	21	17	0
TOTAL	35	27	0

Paradise Road – Northbound departure (north leg)

TOTAL	60
PM	34
MD	0
AM	26

Arbor Avenue – Westbound departure (west leg)

TOTAL	PM	MD	AM
64	33	0	31

Arbor Avenue – Westbound approach (east leg)

	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	0	0	0	0	0
Left	0	0	0	0	0

NORTH

WEST **1-WAY STOP (EB)** EAST

SOUTH

Arbor Avenue – Eastbound approach (west leg)

	LN	AM	MD	PM	TOTAL
Left	0	12	0	23	35
Through	1	0	0	0	0
Right	0	11	0	13	24

Arbor Avenue – Eastbound departure (east leg)

AM	MD	PM	TOTAL
0	0	0	0

Paradise Road – Southbound departure (south leg)

AM	21
MD	0
PM	30
TOTAL	51

Paradise Road – Northbound approach (south leg)

	Left	Through	Right
TOTAL	29	25	0
PM	12	11	0
MD	0	0	0
AM	17	14	0
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#012 Paradise Road & Arbor Avenue - AM PEAK

LOCATION#:	**012**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Paradise Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Arbor Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	3	0	0	0	0	1	0	0	1	0	0	0	5
7:15 AM	3	0	0	0	4	2	3	0	2	0	0	0	14
7:30 AM	2	0	0	0	2	5	3	0	2	0	0	0	14
7:45 AM	6	5	0	0	4	4	2	0	0	0	0	0	21
8:00 AM	5	4	0	0	3	3	3	0	3	0	0	0	21
8:15 AM	4	5	0	0	1	2	4	0	6	0	0	0	22
8:30 AM	1	3	0	0	3	1	1	0	0	0	0	0	9
8:45 AM	4	1	0	0	3	3	5	0	2	0	0	0	18
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	28	18	0	0	20	21	21	0	16	0	0	0	124
P.H.V: 1	17	14	0	0	10	14	12	0	11	0	0	0	78
P.H.F: 2		0.705			0.750			0.575			0.000		0.886

(1) Peak Hour Volume (Peak Hour Begins At 730 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#012 Paradise Road & Arbor Avenue - PM PEAK

LOCATION#:	**012**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Paradise Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Arbor Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	2	2	0	0	9	3	1	0	0	0	0	0	17
4:15 PM	0	3	0	0	2	5	4	0	4	0	0	0	18
4:30 PM	4	4	0	0	2	0	5	0	6	0	0	0	21
4:45 PM	3	1	0	0	5	3	3	0	4	0	0	0	19
5:00 PM	2	2	0	0	0	5	4	0	3	0	0	0	16
5:15 PM	6	3	0	0	4	5	7	0	4	0	0	0	29
5:30 PM	1	5	0	0	8	8	9	0	2	0	0	0	33
5:45 PM	0	0	0	0	4	0	2	0	1	0	0	0	7
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	18	20	0	0	34	29	35	0	24	0	0	0	160
P.H.V: [1]	12	11	0	0	17	21	23	0	13	0	0	0	97
P.H.F: [2]		0.639			0.594			0.818			0.000		0.735

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#012 Paradise Road & Arbor Avenue

LOCATION#:	012	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	Paradise Road	DATE:	Wednesday, September 02, 2009	MD PEAK:	
EAST / WEST:	Arbor Avenue	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

1-WAY STOP (EB)

NORTH / SOUTH / EAST / WEST

Paradise Road (north leg) – Southbound approach

	Right	Through	Left
LN	0	1	0
AM	2	2	0
MD	0	0	0
PM	2	0	0
TOTAL	4	2	0

Paradise Road (north leg) – Northbound departure

TOTAL	6
PM	3
MD	0
AM	3

Arbor Avenue (west leg) – Westbound departure

TOTAL	PM	MD	AM
6	3	0	3

Arbor Avenue (west leg) – Eastbound approach

LN	AM	MD	PM	TOTAL	
0	3	0	2	5	Left
1	0	0	0	0	Through
0	0	0	1	1	Right

Arbor Avenue (east leg) – Westbound approach

	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	0	0	0	0	0
Left	0	0	0	0	0

Arbor Avenue (east leg) – Eastbound departure

AM	MD	PM	TOTAL
0	0	0	0

Paradise Road (south leg) – Southbound departure

AM	2
MD	0
PM	1
TOTAL	3

Paradise Road (south leg) – Northbound approach

	Left	Through	Right
TOTAL	2	1	0
PM	1	1	0
MD	0	0	0
AM	1	0	0
LN	0	1	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#012 Paradise Road & Arbor Avenue - AM PEAK

LOCATION#:	**012**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**Paradise Road**	**DATE:**	**Wednesday, September 02, 2009**
EAST / WEST:	**Arbor Avenue**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	1	0	0	0	0	1	0	0	0	0	0	0	2
7:15 AM	1	0	0	0	0	0	1	0	0	0	0	0	2
7:30 AM	0	0	0	0	0	1	1	0	0	0	0	0	2
7:45 AM	0	0	0	0	1	0	1	0	0	0	0	0	2
8:00 AM	0	0	0	0	1	1	0	0	0	0	0	0	2
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:30 AM	0	0	0	0	0	0	1	0	0	0	0	0	1
8:45 AM	0	0	0	0	1	0	0	0	0	0	0	0	1
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	2	0	0	0	3	3	4	0	0	0	0	0	12
P.H.V: 1	1	0	0	0	2	2	3	0	0	0	0	0	8
P.H.F: 2		0.250			0.500			0.750			0.000		1.000

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#012 Paradise Road & Arbor Avenue - PM PEAK

LOCATION#: 012
NORTH / SOUTH: Paradise Road
EAST / WEST: Arbor Avenue

QTD PROJ#: 090137
DATE: Wednesday, September 02, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	1	0	0	1	0	0	1	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	0	0	1	2	0	0	0	0	0	3
4:30 PM	1	1	0	0	0	0	0	0	1	0	0	0	3
4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	
5:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	1	2	0	0	2	2	2	0	1	0	0	0	10
P.H.V: [1]	1	1	0	0	0	2	2	0	1	0	0	0	7
P.H.F: [2]		0.250			0.500			0.375			0.000		0.583

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#013 I-5 Mainline & E Louise Ave Exit / SR-120 Interchange

LOCATION#:	013	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	I-5 Mainline	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	E Louise Ave Exit / SR-120 Interchange	VICINITY:	Lathrop, CA	PM PEAK:	430 PM

I-5 Mainline (North leg) – Southbound approach

	Right	Thru	Left
LN	0	3	0
AM	0	3394	0
MD	0	0	0
PM	0	3241	0
TOTAL	0	6635	0

I-5 Mainline (North leg) – Northbound departure

TOTAL	6313
PM	3873
MD	0
AM	2440

E Louise Ave Exit / SR-120 Interchange (West leg) – Westbound departure

TOTAL	PM	MD	AM
0	0	0	0

E Louise Ave Exit / SR-120 Interchange (East leg) – Westbound approach

	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Thru	0	0	0	0	0
Left	0	0	0	0	0

NORTH

WEST **NONE** EAST

SOUTH

E Louise Ave Exit / SR-120 Interchange (West leg) – Eastbound approach

LN	AM	MD	PM	TOTAL	
0	0	0	0	0	Left
0	0	0	0	0	Thru
0	0	0	0	0	Right

E Louise Ave Exit / SR-120 Interchange (East leg) – Eastbound departure

AM	MD	PM	TOTAL
0	0	0	0

I-5 Mainline (South leg) – Southbound departure

AM	3394
MD	0
PM	3241
TOTAL	6635

I-5 Mainline (South leg) – Northbound approach

	Left	Thru	Right
TOTAL	0	6313	0
PM	0	3873	0
MD	0	0	0
AM	0	2440	0
LN	0	3	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#013 I-5 Mainline & E Louise Ave Exit / SR-120 Interchange - AM PEAK

LOCATION#:	013	QTD PROJ#:	090137
NORTH / SOUTH:	I-5 Mainline	DATE:	Thursday, September 03, 2009
EAST / WEST:	E Louise Ave Exit / SR-120 Interchange	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	3	0	0	3	0	0	0	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM		478			805								1283
7:15 AM		543			824								1367
7:30 AM		639			895								1534
7:45 AM		640			926								1566
8:00 AM		618			749								1367
8:15 AM		580			755								1335
8:30 AM		578			703								1281
8:45 AM		526			717								1243
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	4602	0	0	6374	0	0	0	0	0	0	0	10976
P.H.V: (1)	0	2440	0	0	3394	0	0	0	0	0	0	0	5834
P.H.F: (2)		0.953			0.916			0.000			0.000		0.931

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#013 I-5 Mainline & E Louise Ave Exit / SR-120 Interchange - PM PEAK

LOCATION#: 013
NORTH / SOUTH: I-5 Mainline
EAST / WEST: E Louise Ave Exit / SR-120 Interchange

QTD PROJ#: 090137
DATE: Thursday, September 03, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	3	0	0	3	0	0	0	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM		851			762								1613
4:15 PM		927			807								1734
4:30 PM		991			785								1776
4:45 PM		1007			756								1763
5:00 PM		951			866								1817
5:15 PM		924			834								1758
5:30 PM		879			812								1691
5:45 PM		850			453								1303
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	7380	0	0	6075	0	0	0	0	0	0	0	13455
P.H.V: (1)	0	3873	0	0	3241	0	0	0	0	0	0	0	7114
P.H.F: (2)		0.962			0.936			0.000			0.000		0.979

(1) Peak Hour Volume (Peak Hour Begins At 430 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#013 I-5 Mainline & E Louise Ave Exit / SR-120 Interchange

LOCATION#:	013	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	I-5 Mainline	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	E Louise Ave Exit / SR-120 Interchange	VICINITY:	Lathrop, CA	PM PEAK:	400 PM

North leg (I-5 Mainline) – southbound approach (Right / Thru / Left)

	Right	Thru	Left
LN	0	3	0
AM	0	493	0
MD	0	0	0
PM	0	436	0
TOTAL	0	929	0

North leg – northbound departure

TOTAL	1029
PM	528
MD	0
AM	501

West leg (E Louise Ave Exit / SR-120 Interchange) – westbound departure

TOTAL	PM	MD	AM
0	0	0	0

East leg (E Louise Ave Exit / SR-120 Interchange) – westbound approach

TOTAL	PM	MD	AM	LN
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

NORTH

WEST **NONE** EAST

SOUTH

West leg – eastbound approach

LN	AM	MD	PM	TOTAL
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

East leg – eastbound departure

AM	MD	PM	TOTAL
0	0	0	0

South leg (I-5 Mainline) – southbound departure

AM	493
MD	0
PM	436
TOTAL	929

South leg – northbound approach (Left / Thru / Right)

	Left	Thru	Right
TOTAL	0	1029	0
PM	0	528	0
MD	0	0	0
AM	0	501	0
LN	0	3	0

AM COUNT 7:00 AM TO 9:00 AM **MD COUNT** - TO - **PM COUNT** 4:00 PM TO 6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#013 I-5 Mainline & E Louise Ave Exit / SR-120 Interchange - AM PEAK

LOCATION#:	**013**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 Mainline**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**E Louise Ave Exit / SR-120 Interchange**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	3	0	0	3	0	0	0	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM		99			110								209
7:15 AM		114			111								225
7:30 AM		115			113								228
7:45 AM		139			115								254
8:00 AM		122			135								257
8:15 AM		118			123								241
8:30 AM		122			120								242
8:45 AM		120			129								249
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	949	0	0	956	0	0	0	0	0	0	0	1905
P.H.V: 1	0	501	0	0	493	0	0	0	0	0	0	0	994
P.H.F: 2		0.901			0.913			0.000			0.000		0.967

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)

(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#013 I-5 Mainline & E Louise Ave Exit / SR-120 Interchange - PM PEAK

LOCATION#:	**013**		**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 Mainline**		**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**E Louise Ave Exit / SR-120 Interchange**		**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	3	0	0	3	0	0	0	0	0	0	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM		121			119								240
4:15 PM		143			110								253
4:30 PM		153			105								258
4:45 PM		111			102								213
5:00 PM		109			113								222
5:15 PM		110			125								235
5:30 PM		121			119								240
5:45 PM		125			121								246
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	993	0	0	914	0	0	0	0	0	0	0	1907
P.H.V: 1	0	528	0	0	436	0	0	0	0	0	0	0	964
P.H.F: 2		0.863			0.916			0.000			0.000		0.934

(1) Peak Hour Volume (Peak Hour Begins At 400 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#014 I-5 Interchange / Guthmiller Rd Exit & SR-120 Mainline

LOCATION#:	014	QTD PROJ#:	090137	AM PEAK:	715 AM
NORTH / SOUTH:	I-5 Interchange / Guthmiller Rd Exit	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	SR-120 Mainline	VICINITY:	Lathrop, CA	PM PEAK:	445 PM

North Leg – I-5 Interchange / Guthmiller Rd Exit

Southbound approach (right turn / through / left turn):

LN	0	0	0
AM	0	0	0
MD	0	0	0
PM	0	0	0
TOTAL	0	0	0

Northbound departure:

TOTAL	0
PM	0
MD	0
AM	0

West Leg – SR-120 Mainline

Westbound departure:

TOTAL	PM	MD	AM
5340	2299	0	3041

SR-120 Mainline

Eastbound approach (left turn / through / right turn):

LN	AM	MD	PM	TOTAL
0	0	0	0	0
2	2025	0	3432	5457
0	0	0	0	0

Intersection

NORTH

WEST **NONE** EAST

SOUTH

East Leg – SR-120 Mainline

Westbound approach (right turn / through / left turn):

TOTAL	PM	MD	AM	LN
0	0	0	0	0
5340	2299	0	3041	2
0	0	0	0	0

SR-120 Mainline

Eastbound departure:

AM	MD	PM	TOTAL
2025	0	3432	5457

South Leg – I-5 Interchange / Guthmiller Rd Exit

Southbound departure:

AM	0
MD	0
PM	0
TOTAL	0

Northbound approach (left turn / through / right turn):

TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT

#014 I-5 Interchange / Guthmiller Rd Exit & SR-120 Mainline - AM PEAK

LOCATION#:	014		QTD PROJ#:	090137
NORTH / SOUTH:	I-5 Interchange / Guthmiller Rd Exit		DATE:	Thursday, September 03, 2009
EAST / WEST:	SR-120 Mainline		VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM								380			620		1000
7:15 AM								509			768		1277
7:30 AM								545			908		1453
7:45 AM								510			748		1258
8:00 AM								461			617		1078
8:15 AM								454			630		1084
8:30 AM								431			669		1100
8:45 AM								273			626		899
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	3563	0	0	5586	0	9149
P.H.V: (1)	0	0	0	0	0	0	0	2025	0	0	3041	0	5066
P.H.F: (2)		0.000			0.000			0.929			0.837		0.872

(1) Peak Hour Volume (Peak Hour Begins At 715 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#014 I-5 Interchange / Guthmiller Rd Exit & SR-120 Mainline - PM PEAK

LOCATION#: 014
NORTH / SOUTH: I-5 Interchange / Guthmiller Rd Exit
EAST / WEST: SR-120 Mainline

QTD PROJ#: 090137
DATE: Thursday, September 03, 2009
VICINITY: Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM								761			545		1306
4:15 PM								835			561		1396
4:30 PM								856			565		1421
4:45 PM								850			542		1392
5:00 PM								814			578		1392
5:15 PM								928			563		1491
5:30 PM								840			616		1456
5:45 PM								770			558		1328
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	6654	0	0	4528	0	11182
P.H.V: (1)	0	0	0	0	0	0	0	3432	0	0	2299	0	5731
P.H.F: (2)		0.000			0.000			0.925			0.933		0.961

(1) Peak Hour Volume (Peak Hour Begins At 445 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#014 I-5 Interchange / Guthmiller Rd Exit & SR-120 Mainline

LOCATION#:	014	QTD PROJ#:	090137	AM PEAK:	745 AM
NORTH / SOUTH:	I-5 Interchange / Guthmiller Rd Exit	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	SR-120 Mainline	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

North leg: I-5 Interchange / Guthmiller Rd Exit

Southbound approach (right, thru, left):

LN	0	0	0
AM	0	0	0
MD	0	0	0
PM	0	0	0
TOTAL	0	0	0

Northbound departure:

TOTAL	0
PM	0
MD	0
AM	0

West leg: SR-120 Mainline

Westbound departure:

TOTAL	PM	MD	AM
567	194	0	373

Eastbound approach:

LN	AM	MD	PM	TOTAL
0	0	0	0	0
2	321	0	258	579
0	0	0	0	0

NORTH

WEST **NONE** EAST

SOUTH

East leg: SR-120 Mainline

Westbound approach:

TOTAL	PM	MD	AM	LN
0	0	0	0	0
567	194	0	373	2
0	0	0	0	0

Eastbound departure:

AM	MD	PM	TOTAL
321	0	258	579

South leg: I-5 Interchange / Guthmiller Rd Exit

Southbound departure:

AM	0
MD	0
PM	0
TOTAL	0

Northbound approach (left, thru, right):

TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT 7:00 AM TO 9:00 AM **MD COUNT** - TO - **PM COUNT** 4:00 PM TO 6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#014 I-5 Interchange / Guthmiller Rd Exit & SR-120 Mainline - AM PEAK

LOCATION#:	**014**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 Interchange / Guthmiller Rd Exit**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**SR-120 Mainline**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM								69			62		131
7:15 AM								74			76		150
7:30 AM								82			85		167
7:45 AM								87			86		173
8:00 AM								87			81		168
8:15 AM								81			99		180
8:30 AM								66			107		173
8:45 AM								41			95		136
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	0	0	0	0	0	0	587	0	0	691	0	1278
P.H.V: (1)	0	0	0	0	0	0	0	321	0	0	373	0	694
P.H.F: (2)		0.000			0.000			0.922			0.871		0.964

(1) Peak Hour Volume (Peak Hour Begins At 745 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#014 I-5 Interchange / Guthmiller Rd Exit & SR-120 Mainline - PM PEAK

LOCATION#:	014	QTD PROJ#:	090137
NORTH / SOUTH:	I-5 Interchange / Guthmiller Rd Exit	DATE:	Thursday, September 03, 2009
EAST / WEST:	SR-120 Mainline	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM								45			52		97
4:15 PM								68			64		132
4:30 PM								80			45		125
4:45 PM								50			35		85
5:00 PM								60			50		110
5:15 PM								55			52		107
5:30 PM								63			51		114
5:45 PM								53			44		97
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	474	0	0	393	0	867
P.H.V: 1	0	0	0	0	0	0	0	258	0	0	194	0	452
P.H.F: 2		0.000			0.000			0.806			0.758		0.856

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY

#015 I-5 Interchange / Guthmiller Rd Exit & I-205 Mainline

LOCATION#:	015	QTD PROJ#:	090137	AM PEAK:	700 AM
NORTH / SOUTH:	I-5 Interchange / Guthmiller Rd Exit	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-205 Mainline	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

Southbound approach (I-5 Interchange / Guthmiller Rd Exit)

LN	0	0	0
AM	0	0	0
MD	0	0	0
PM	0	0	0
TOTAL	0	0	0

Northbound departure (I-5 Interchange / Guthmiller Rd Exit)

TOTAL	PM	MD	AM
0	0	0	0

Westbound departure (I-205 Mainline)

TOTAL	PM	MD	AM
5876	2404	0	3472

I-205 Mainline

Westbound approach (I-205 Mainline)

TOTAL	PM	MD	AM	LN
0	0	0	0	0
5876	2404	0	3472	2
0	0	0	0	0

NORTH

WEST **NONE** EAST

SOUTH

Eastbound approach (I-205 Mainline)

LN	AM	MD	PM	TOTAL
0	0	0	0	0
2	2038	0	3777	5815
0	0	0	0	0

I-205 Mainline

Eastbound departure (I-205 Mainline)

AM	MD	PM	TOTAL
2038	0	3777	5815

Southbound departure (I-5 Interchange / Guthmiller Rd Exit)

AM	MD	PM	TOTAL
0	0	0	0

Northbound approach (I-5 Interchange / Guthmiller Rd Exit)

TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT	7:00 AM	TO	9:00 AM	
MD COUNT	-	TO	-	
PM COUNT	4:00 PM	TO	6:00 PM	

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VEHICLE TURNING MOVEMENT COUNT

#015 I-5 Interchange / Guthmiller Rd Exit & I-205 Mainline - AM PEAK

LOCATION#:	015	QTD PROJ#:	090137
NORTH / SOUTH:	I-5 Interchange / Guthmiller Rd Exit	DATE:	Thursday, September 03, 2009
EAST / WEST:	I-205 Mainline	VICINITY:	Lathrop, CA

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM								485			779		1264
7:15 AM								513			928		1441
7:30 AM								531			912		1443
7:45 AM								509			853		1362
8:00 AM								465			686		1151
8:15 AM								474			810		1284
8:30 AM								439			775		1214
8:45 AM								368			491		859
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	3784	0	0	6234	0	10018
P.H.V: 1	0	0	0	0	0	0	0	2038	0	0	3472	0	5510
P.H.F: 2		0.000			0.000			0.960			0.935		0.955

(1) Peak Hour Volume (Peak Hour Begins At 700 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT

#015 I-5 Interchange / Guthmiller Rd Exit & I-205 Mainline - PM PEAK

LOCATION#:	**015**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 Interchange / Guthmiller Rd Exit**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-205 Mainline**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	**TOTALS**
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM								855			525		1380
4:15 PM								974			635		1609
4:30 PM								917			612		1529
4:45 PM								941			574		1515
5:00 PM								945			583		1528
5:15 PM								824			599		1423
5:30 PM								795			584		1379
5:45 PM								766			575		1341
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	**NL**	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**	
TOTAL:	0	0	0	0	0	0	0	7017	0	0	4687	0	11704
P.H.V: 1	0	0	0	0	0	0	0	3777	0	0	2404	0	6181
P.H.F: 2		0.000			0.000			0.969			0.946		0.960

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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PEAK HOUR ITM SUMMARY (TRUCKS)

#015 I-5 Interchange / Guthmiller Rd Exit & I-205 Mainline

LOCATION#:	015	QTD PROJ#:	090137	AM PEAK:	800 AM
NORTH / SOUTH:	I-5 Interchange / Guthmiller Rd Exit	DATE:	Thursday, September 03, 2009	MD PEAK:	
EAST / WEST:	I-205 Mainline	VICINITY:	Lathrop, CA	PM PEAK:	415 PM

Southbound approach (I-5 Interchange / Guthmiller Rd Exit, north leg) — movements: right, through, left

	Right	Through	Left
LN	0	0	0
AM	0	0	0
MD	0	0	0
PM	0	0	0
TOTAL	0	0	0

Northbound departure (north leg)

TOTAL	PM	MD	AM
0	0	0	0

Westbound departure (I-205 Mainline, west leg)

TOTAL	PM	MD	AM
661	231	0	430

Westbound approach (I-205 Mainline, east leg)

	TOTAL	PM	MD	AM	LN
Right	0	0	0	0	0
Through	661	231	0	430	2
Left	0	0	0	0	0

NORTH

WEST **NONE** EAST

SOUTH

Eastbound approach (I-205 Mainline, west leg)

	LN	AM	MD	PM	TOTAL
Left	0	0	0	0	0
Through	2	465	0	306	771
Right	0	0	0	0	0

Eastbound departure (east leg)

AM	MD	PM	TOTAL
465	0	306	771

Southbound departure (I-5 Interchange / Guthmiller Rd Exit, south leg)

AM	MD	PM	TOTAL
0	0	0	0

Northbound approach (south leg) — movements: left, through, right

	Left	Through	Right
TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0
LN	0	0	0

AM COUNT	7:00 AM	TO	9:00 AM	MD COUNT	-	TO	-	PM COUNT	4:00 PM	TO	6:00 PM

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#015 I-5 Interchange / Guthmiller Rd Exit & I-205 Mainline - AM PEAK

LOCATION#:	**015**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 Interchange / Guthmiller Rd Exit**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-205 Mainline**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM								81			92		173
7:15 AM								93			104		197
7:30 AM								88			105		193
7:45 AM								92			112		204
8:00 AM								102			101		203
8:15 AM								112			113		225
8:30 AM								135			105		240
8:45 AM								116			111		227
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	819	0	0	843	0	1662
P.H.V: 1	0	0	0	0	0	0	0	465	0	0	430	0	895
P.H.F: 2		0.000			0.000			0.861			0.951		0.932

(1) Peak Hour Volume (Peak Hour Begins At 800 AM)
(2) Peak Hour Factor (directional aggregate)

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VEHICLE TURNING MOVEMENT COUNT (TRUCKS)

#015 I-5 Interchange / Guthmiller Rd Exit & I-205 Mainline - PM PEAK

LOCATION#:	**015**	**QTD PROJ#:**	**090137**
NORTH / SOUTH:	**I-5 Interchange / Guthmiller Rd Exit**	**DATE:**	**Thursday, September 03, 2009**
EAST / WEST:	**I-205 Mainline**	**VICINITY:**	**Lathrop, CA**

DIRECTION:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTALS
LANES:	0	0	0	0	0	0	0	2	0	0	2	0	
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM								49			58		107
4:15 PM								69			69		138
4:30 PM								76			64		140
4:45 PM								85			53		138
5:00 PM								76			45		121
5:15 PM								54			55		109
5:30 PM								57			51		108
5:45 PM								64			55		119
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

VOLUME STATS:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
TOTAL:	0	0	0	0	0	0	0	530	0	0	450	0	980
P.H.V: 1	0	0	0	0	0	0	0	306	0	0	231	0	537
P.H.F: 2		0.000			0.000			0.900			0.837		0.959

(1) Peak Hour Volume (Peak Hour Begins At 415 PM)
(2) Peak Hour Factor (directional aggregate)

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Appendix C – Level of Service Worksheets: Existing

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	163	274	248	15	72	93
Peak Hour Factor	0.88	0.88	0.90	0.90	0.70	0.70
Hourly flow rate (vph)	185	311	276	17	103	133
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			277			
pX, platoon unblocked	0.98				0.98	0.98
vC, conflicting volume	292				957	276
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	280				957	263
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	85				57	82
cM capacity (veh/h)	1255				238	758

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	185	311	276	17	236
Volume Left	185	0	0	0	103
Volume Right	0	0	0	17	133
cSH	1255	1700	1700	1700	388
Volume to Capacity	0.15	0.18	0.16	0.01	0.61
Queue Length 95th (ft)	13	0	0	0	97
Control Delay (s)	8.4	0.0	0.0	0.0	27.7
Lane LOS	A				D
Approach Delay (s)	3.1		0.0		27.7
Approach LOS					D

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	394	390	213	238	248
v/c Ratio	0.62	0.84	0.18	0.77	0.72
Control Delay	23.9	31.5	2.8	44.0	33.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	23.9	31.5	2.8	44.0	33.2
Queue Length 50th (ft)	137	99	31	100	77
Queue Length 95th (ft)	#230	#263	1	142	120
Internal Link Dist (ft)	197		439		1389
Turn Bay Length (ft)		190			
Base Capacity (vph)	643	516	1185	334	364
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.76	0.18	0.71	0.68

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	
Lane Util. Factor		1.00		1.00	1.00					0.95	0.95	
Frt		0.96		1.00	1.00					1.00	0.93	
Flt Protected		1.00		0.95	1.00					0.95	0.98	
Satd. Flow (prot)		1799		1641	1727					1545	1475	
Flt Permitted		1.00		0.95	1.00					0.95	0.98	
Satd. Flow (perm)		1799		1641	1727					1545	1475	
Volume (vph)	0	243	116	351	192	0	0	0	0	272	5	87
Peak-hour factor, PHF	0.91	0.91	0.91	0.90	0.90	0.90	0.92	0.92	0.92	0.75	0.75	0.75
Adj. Flow (vph)	0	267	127	390	213	0	0	0	0	363	7	116
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	0	0	46	0
Lane Group Flow (vph)	0	371	0	390	213	0	0	0	0	238	202	0
Heavy Vehicles (%)	1%	1%	1%	10%	10%	10%	2%	2%	2%	11%	11%	11%
Turn Type				Prot						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases												
Actuated Green, G (s)		22.7		19.7	46.6					13.5	13.5	
Effective Green, g (s)		24.0		19.9	47.9					14.1	14.1	
Actuated g/C Ratio		0.34		0.28	0.68					0.20	0.20	
Clearance Time (s)		5.3		4.2	5.3					4.6	4.6	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		617		467	1182					311	297	
v/s Ratio Prot		c0.21		c0.24	0.12					c0.15	0.14	
v/s Ratio Perm												
v/c Ratio		0.60		0.84	0.18					0.77	0.68	
Uniform Delay, d1		19.0		23.5	4.0					26.4	25.9	
Progression Factor		1.00		0.66	0.58					1.00	1.00	
Incremental Delay, d2		4.3		11.2	0.3					10.7	6.1	
Delay (s)		23.3		26.8	2.6					37.1	31.9	
Level of Service		C		C	A					D	C	
Approach Delay (s)		23.3			18.3			0.0			34.4	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	63	584	512	327	90	296
v/c Ratio	0.34	0.23	0.47	0.22	0.39	0.65
Control Delay	35.8	1.1	6.4	0.3	30.8	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	1.1	6.4	0.3	30.8	10.7
Queue Length 50th (ft)	20	2	78	0	36	0
Queue Length 95th (ft)	m35	28	123	0	64	47
Internal Link Dist (ft)		439	223		1655	
Turn Bay Length (ft)	100					
Base Capacity (vph)	188	2491	1087	1468	412	584
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.23	0.47	0.22	0.22	0.51

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lane Util. Factor	1.00	0.95			1.00	1.00		1.00	1.00			
Frt	1.00	1.00			1.00	0.85		1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00		0.96	1.00			
Satd. Flow (prot)	1687	3374			1727	1468		1552	1380			
Flt Permitted	0.95	1.00			1.00	1.00		0.96	1.00			
Satd. Flow (perm)	1687	3374			1727	1468		1552	1380			
Volume (vph)	52	479	0	0	435	278	71	5	252	0	0	0
Peak-hour factor, PHF	0.82	0.82	0.82	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	63	584	0	0	512	327	84	6	296	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	252	0	0	0
Lane Group Flow (vph)	63	584	0	0	512	327	0	90	44	0	0	0
Heavy Vehicles (%)	7%	7%	7%	10%	10%	10%	17%	17%	17%	2%	2%	2%
Turn Type	Prot					Free	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						Free			2			
Actuated Green, G (s)	5.1	50.4			41.8	70.0		9.7	9.7			
Effective Green, g (s)	5.3	51.7			42.4	70.0		10.3	10.3			
Actuated g/C Ratio	0.08	0.74			0.61	1.00		0.15	0.15			
Clearance Time (s)	4.2	5.3			4.6			4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0			
Lane Grp Cap (vph)	128	2492			1046	1468		228	203			
v/s Ratio Prot	c0.04	0.17			c0.30			c0.06				
v/s Ratio Perm						0.22			0.03			
v/c Ratio	0.49	0.23			0.49	0.22		0.39	0.21			
Uniform Delay, d1	31.1	2.9			7.7	0.0		27.0	26.3			
Progression Factor	1.12	0.26			0.52	1.00		1.00	1.00			
Incremental Delay, d2	2.2	0.2			1.6	0.3		1.1	0.5			
Delay (s)	37.0	0.9			5.6	0.3		28.2	26.8			
Level of Service	D	A			A	A		C	C			
Approach Delay (s)		4.4			3.5			27.1			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	167	377	288	74	536	173	58	27	61
v/c Ratio	0.68	0.22	0.32	0.35	0.34	0.59	0.23	0.26	0.20
Control Delay	34.5	5.3	1.4	31.8	13.2	39.9	18.4	38.3	19.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.5	5.3	1.4	31.8	13.2	39.9	18.4	38.3	19.3
Queue Length 50th (ft)	50	17	0	30	82	38	10	11	6
Queue Length 95th (ft)	m#137	36	4	63	120	60	37	32	21
Internal Link Dist (ft)		589			503		673		1499
Turn Bay Length (ft)	450		300	250				100	
Base Capacity (vph)	256	1729	908	220	1595	295	465	102	752
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.22	0.32	0.34	0.34	0.59	0.12	0.26	0.08

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1626	3252	1455	1671	3324		2993	1506		1480	2748	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1626	3252	1455	1671	3324		2993	1506		1480	2748	
Volume (vph)	154	347	265	67	470	18	142	25	23	23	27	24
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.82	0.82	0.82	0.84	0.84	0.84
Adj. Flow (vph)	167	377	288	74	516	20	173	30	28	27	32	29
RTOR Reduction (vph)	0	0	149	0	3	0	0	24	0	0	27	0
Lane Group Flow (vph)	167	377	139	74	533	0	173	34	0	27	34	0
Heavy Vehicles (%)	11%	11%	11%	8%	8%	8%	17%	17%	17%	22%	22%	22%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	11.2	33.3	33.3	7.5	29.6		6.7	9.3		1.6	4.9	
Effective Green, g (s)	11.4	33.9	33.9	7.7	30.2		6.9	10.6		1.8	5.5	
Actuated g/C Ratio	0.16	0.48	0.48	0.11	0.43		0.10	0.15		0.03	0.08	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	265	1575	705	184	1434		295	228		38	216	
v/s Ratio Prot	c0.10	0.12		0.04	c0.16		c0.06	c0.02		0.02	0.01	
v/s Ratio Perm			0.10									
v/c Ratio	0.63	0.24	0.20	0.40	0.37		0.59	0.15		0.71	0.16	
Uniform Delay, d1	27.3	10.5	10.3	29.0	13.5		30.2	25.8		33.8	30.1	
Progression Factor	0.66	0.45	0.25	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.6	0.3	0.6	1.4	0.7		3.0	0.3		47.3	0.3	
Delay (s)	22.6	5.0	3.2	30.4	14.2		33.1	26.1		81.1	30.4	
Level of Service	C	A	A	C	B		C	C		F	C	
Approach Delay (s)		7.9			16.2			31.4			46.0	
Approach LOS		A			B			C			D	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	2	2	2	49	84	1
Peak Hour Factor	0.33	0.33	0.85	0.85	0.82	0.82
Hourly flow rate (vph)	6	6	2	58	102	1

Direction, Lane #	SE 1	SE 2	NE 1	NE 2	SW 1	SW 2
Volume Total (vph)	6	6	2	58	102	1
Volume Left (vph)	6	0	2	0	0	0
Volume Right (vph)	0	6	0	0	0	1
Hadj (s)	0.65	-0.55	0.81	0.31	0.07	-0.63
Departure Headway (s)	5.5	4.3	5.4	4.9	4.6	3.9
Degree Utilization, x	0.01	0.01	0.00	0.08	0.13	0.00
Capacity (veh/h)	626	791	659	721	770	906
Control Delay (s)	7.4	6.2	7.2	7.1	7.1	5.7
Approach Delay (s)	6.8		7.1		7.1	
Approach LOS	A		A		A	

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	14.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	26	30	24	24	18	67
Peak Hour Factor	0.74	0.74	0.75	0.75	0.79	0.79
Hourly flow rate (vph)	35	41	32	32	23	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	178	48			64	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	178	48			64	
tC, single (s)	6.6	6.4			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.5			2.2	
p0 queue free %	95	96			99	
cM capacity (veh/h)	758	969			1526	

Direction, Lane #	NW 1	NE 1	SW 1
Volume Total	76	64	108
Volume Left	35	0	23
Volume Right	41	32	0
cSH	858	1700	1526
Volume to Capacity	0.09	0.04	0.01
Queue Length 95th (ft)	7	0	1
Control Delay (s)	9.6	0.0	1.7
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	1.7
Approach LOS	A		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	21.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	38	11	31	81	14
Peak Hour Factor	0.88	0.88	0.75	0.75	0.91	0.91
Hourly flow rate (vph)	5	43	15	41	89	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	229	35			56	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	229	35			56	
tC, single (s)	6.6	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.7	3.5			2.3	
p0 queue free %	99	96			94	
cM capacity (veh/h)	676	986			1481	

Direction, Lane #	NW 1	NE 1	SW 1
Volume Total	48	56	104
Volume Left	5	0	89
Volume Right	43	41	0
cSH	944	1700	1481
Volume to Capacity	0.05	0.03	0.06
Queue Length 95th (ft)	4	0	5
Control Delay (s)	9.0	0.0	6.5
Lane LOS	A		A
Approach Delay (s)	9.0	0.0	6.5
Approach LOS	A		

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	21.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	22	29	28	10	13	15
Peak Hour Factor	0.85	0.85	0.63	0.63	0.78	0.78
Hourly flow rate (vph)	26	34	44	16	17	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	131	26	36			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	131	26	36			
tC, single (s)	6.6	6.4	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.5	2.3			
p0 queue free %	97	97	97			
cM capacity (veh/h)	794	995	1519			

Direction, Lane #	SE 1	NE 1	SW 1
Volume Total	60	60	36
Volume Left	26	44	0
Volume Right	34	0	19
cSH	897	1519	1700
Volume to Capacity	0.07	0.03	0.02
Queue Length 95th (ft)	5	2	0
Control Delay (s)	9.3	5.5	0.0
Lane LOS	A	A	
Approach Delay (s)	9.3	5.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	225	171	245	25	320
v/c Ratio	0.65	0.16	0.24	0.17	0.25
Control Delay	15.1	5.4	1.9	29.8	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	15.1	5.4	1.9	29.8	1.8
Queue Length 50th (ft)	9	12	0	8	2
Queue Length 95th (ft)	45	74	32	m10	m28
Internal Link Dist (ft)	937	792			278
Turn Bay Length (ft)				70	
Base Capacity (vph)	581	1099	1002	231	1263
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.39	0.16	0.24	0.11	0.25

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		0.88						1.00	0.85	1.00	1.00	
Flt Protected		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1341						1520	1292	1583	1667	
Flt Permitted		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1341						1520	1292	1583	1667	
Volume (vph)	15	3	162	0	0	0	0	166	238	20	259	0
Peak-hour factor, PHF	0.80	0.80	0.80	0.92	0.92	0.92	0.97	0.97	0.97	0.81	0.81	0.81
Adj. Flow (vph)	19	4	202	0	0	0	0	171	245	25	320	0
RTOR Reduction (vph)	0	176	0	0	0	0	0	0	79	0	0	0
Lane Group Flow (vph)	0	49	0	0	0	0	0	171	166	25	320	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	25%	25%	25%	14%	14%	14%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		8.3						46.4	46.4	1.6	52.2	
Effective Green, g (s)		8.9						47.3	47.3	1.8	53.1	
Actuated g/C Ratio		0.13						0.68	0.68	0.03	0.76	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		170						1027	873	41	1265	
v/s Ratio Prot		c0.04						0.11		c0.02	c0.19	
v/s Ratio Perm									0.13			
v/c Ratio		0.29						0.17	0.19	0.61	0.25	
Uniform Delay, d1		27.7						4.1	4.2	33.8	2.5	
Progression Factor		1.00						1.00	1.00	0.97	0.46	
Incremental Delay, d2		0.9						0.3	0.5	18.7	0.4	
Delay (s)		28.6						4.5	4.7	51.4	1.5	
Level of Service		C						A	A	D	A	
Approach Delay (s)		28.6			0.0			4.6			5.1	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	329	165	48	84
v/c Ratio	0.76	0.63	0.05	0.14
Control Delay	32.7	32.1	3.6	19.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	32.7	32.1	3.6	19.3
Queue Length 50th (ft)	123	66	7	21
Queue Length 95th (ft)	171	m104	m6	44
Internal Link Dist (ft)	803		278	1416
Turn Bay Length (ft)		100		
Base Capacity (vph)	620	385	897	580
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.53	0.43	0.05	0.14

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	1.00			1.00	
Frt					0.98		1.00	1.00			0.98	
Flt Protected					0.96		0.95	1.00			1.00	
Satd. Flow (prot)					1550		1388	1462			1568	
Flt Permitted					0.96		0.95	1.00			1.00	
Satd. Flow (perm)					1550		1388	1462			1568	
Volume (vph)	0	0	0	233	5	51	140	41	0	0	46	7
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.85	0.85	0.85	0.63	0.63	0.63
Adj. Flow (vph)	0	0	0	265	6	58	165	48	0	0	73	11
RTOR Reduction (vph)	0	0	0	0	13	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	0	0	316	0	165	48	0	0	78	0
Heavy Vehicles (%)	2%	2%	2%	15%	15%	15%	30%	30%	30%	19%	19%	19%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					18.5		13.1	42.0			24.7	
Effective Green, g (s)					19.1		13.3	42.9			25.6	
Actuated g/C Ratio					0.27		0.19	0.61			0.37	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					423		264	896			573	
v/s Ratio Prot					c0.20		c0.12	0.03			c0.05	
v/s Ratio Perm												
v/c Ratio					0.75		0.62	0.05			0.14	
Uniform Delay, d1					23.2		26.1	5.4			14.8	
Progression Factor					1.00		0.86	0.48			1.00	
Incremental Delay, d2					7.0		4.5	0.1			0.5	
Delay (s)					30.3		26.8	2.7			15.3	
Level of Service					C		C	A			B	
Approach Delay (s)		0.0			30.3			21.4			15.3	
Approach LOS		A			C			C			B	

Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	11	19	5	28	3	58	26	8	2	17	8
Peak Hour Factor	0.80	0.80	0.80	0.64	0.64	0.64	0.89	0.89	0.89	0.61	0.61	0.61
Hourly flow rate (vph)	19	14	24	8	44	5	65	29	9	3	28	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	56	56	103	44
Volume Left (vph)	19	8	65	3
Volume Right (vph)	24	5	9	13
Hadj (s)	0.00	0.03	0.33	0.01
Departure Headway (s)	4.3	4.3	4.5	4.3
Degree Utilization, x	0.07	0.07	0.13	0.05
Capacity (veh/h)	801	797	767	802
Control Delay (s)	7.6	7.7	8.2	7.5
Approach Delay (s)	7.6	7.7	8.2	7.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	23.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	12	11	17	14	10	14
Peak Hour Factor	0.58	0.58	0.71	0.71	0.75	0.75
Hourly flow rate (vph)	21	19	24	20	13	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	90	23	32			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	90	23	32			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	98	98	98			
cM capacity (veh/h)	879	1034	1542			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	40	44	32
Volume Left	21	24	0
Volume Right	19	0	19
cSH	947	1542	1700
Volume to Capacity	0.04	0.02	0.02
Queue Length 95th (ft)	3	1	0
Control Delay (s)	9.0	4.1	0.0
Lane LOS	A	A	
Approach Delay (s)	9.0	4.1	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	18.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	94	311	426	37	26	89
Peak Hour Factor	0.92	0.92	0.89	0.89	0.85	0.85
Hourly flow rate (vph)	102	338	479	42	31	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			277			
pX, platoon unblocked	0.92				0.92	0.92
vC, conflicting volume	520				1021	479
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	478				1023	433
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				86	82
cM capacity (veh/h)	1001				216	574

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	102	338	479	42	135
Volume Left	102	0	0	0	31
Volume Right	0	0	0	42	105
cSH	1001	1700	1700	1700	418
Volume to Capacity	0.10	0.20	0.28	0.02	0.32
Queue Length 95th (ft)	8	0	0	0	35
Control Delay (s)	9.0	0.0	0.0	0.0	17.7
Lane LOS	A				C
Approach Delay (s)	2.1		0.0		17.7
Approach LOS					C

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	373	282	396	183	228
v/c Ratio	0.59	0.76	0.35	0.70	0.70
Control Delay	14.3	34.6	4.2	38.2	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.3	34.6	4.2	38.2	27.9
Queue Length 50th (ft)	63	65	32	46	33
Queue Length 95th (ft)	111	#191	58	#149	#142
Internal Link Dist (ft)	197		439		1389
Turn Bay Length (ft)		190			
Base Capacity (vph)	770	379	1220	261	324
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.48	0.74	0.32	0.70	0.70

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	
Lane Util. Factor		1.00		1.00	1.00					0.95	0.95	
Frt		0.96		1.00	1.00					1.00	0.92	
Flt Protected		1.00		0.95	1.00					0.95	0.98	
Satd. Flow (prot)		1754		1656	1743					1618	1533	
Flt Permitted		1.00		0.95	1.00					0.95	0.98	
Satd. Flow (perm)		1754		1656	1743					1618	1533	
Volume (vph)	0	223	94	262	368	0	0	0	0	265	1	108
Peak-hour factor, PHF	0.85	0.85	0.85	0.93	0.93	0.93	0.92	0.92	0.92	0.91	0.91	0.91
Adj. Flow (vph)	0	262	111	282	396	0	0	0	0	291	1	119
RTOR Reduction (vph)	0	35	0	0	0	0	0	0	0	0	76	0
Lane Group Flow (vph)	0	338	0	282	396	0	0	0	0	183	152	0
Heavy Vehicles (%)	4%	4%	4%	9%	9%	9%	2%	2%	2%	6%	6%	6%
Turn Type				Prot						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases												
Actuated Green, G (s)		13.5		9.7	27.4					6.5	6.5	
Effective Green, g (s)		14.8		9.9	28.7					7.1	7.1	
Actuated g/C Ratio		0.34		0.23	0.66					0.16	0.16	
Clearance Time (s)		5.3		4.2	5.3					4.6	4.6	
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		593		374	1142					262	249	
v/s Ratio Prot		c0.19		c0.17	0.23					c0.11	0.10	
v/s Ratio Perm												
v/c Ratio		0.57		0.75	0.35					0.70	0.61	
Uniform Delay, d1		11.9		15.8	3.4					17.3	17.1	
Progression Factor		1.00		1.00	1.00					1.00	1.00	
Incremental Delay, d2		1.3		8.4	0.2					7.9	4.2	
Delay (s)		13.2		24.2	3.6					25.2	21.2	
Level of Service		B		C	A					C	C	
Approach Delay (s)		13.2			12.1			0.0			23.0	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	43.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	NBT	NBR
Lane Group Flow (vph)	55	485	448	406	141	453
v/c Ratio	0.27	0.30	0.62	0.28	0.29	0.68
Control Delay	26.6	6.8	15.7	0.5	14.7	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.6	6.8	15.7	0.5	14.7	10.3
Queue Length 50th (ft)	8	22	45	0	16	13
Queue Length 95th (ft)	49	69	222	0	74	108
Internal Link Dist (ft)		439	223		1655	
Turn Bay Length (ft)	100					
Base Capacity (vph)	201	2131	895	1468	728	841
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.23	0.50	0.28	0.19	0.54

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lane Util. Factor	1.00	0.95			1.00	1.00		1.00	1.00			
Frt	1.00	1.00			1.00	0.85		1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1703	3406			1727	1468		1671	1495			
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1703	3406			1727	1468		1671	1495			
Volume (vph)	52	456	0	0	417	378	135	0	435	0	0	0
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.93	0.93	0.96	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	55	485	0	0	448	406	141	0	453	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	244	0	0	0
Lane Group Flow (vph)	55	485	0	0	448	406	0	141	209	0	0	0
Heavy Vehicles (%)	6%	6%	6%	10%	10%	10%	8%	8%	8%	2%	2%	2%
Turn Type	Prot					Free	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						Free			2			
Actuated Green, G (s)	1.3	20.6			15.8	41.2		10.7	10.7			
Effective Green, g (s)	1.5	21.9			16.4	41.2		11.3	11.3			
Actuated g/C Ratio	0.04	0.53			0.40	1.00		0.27	0.27			
Clearance Time (s)	4.2	5.3			4.6			4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0			
Lane Grp Cap (vph)	62	1810			687	1468		458	410			
v/s Ratio Prot	0.03	0.14			c0.26			0.08				
v/s Ratio Perm						c0.28			c0.14			
v/c Ratio	0.89	0.27			0.65	0.28		0.31	0.51			
Uniform Delay, d1	19.8	5.3			10.1	0.0		11.9	12.6			
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2	74.6	0.1			2.2	0.5		0.4	1.1			
Delay (s)	94.4	5.4			12.3	0.5		12.2	13.7			
Level of Service	F	A			B	A		B	B			
Approach Delay (s)		14.4			6.7			13.3			0.0	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	41.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	276	560	144	82	428	365	144	57	80
v/c Ratio	0.68	0.39	0.20	0.37	0.56	0.62	0.39	0.31	0.19
Control Delay	33.8	16.2	4.6	31.5	23.3	30.1	18.8	32.9	22.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.8	16.2	4.6	31.5	23.3	30.1	18.8	32.9	22.8
Queue Length 50th (ft)	96	90	0	29	75	67	29	20	12
Queue Length 95th (ft)	#237	151	36	72	122	#114	71	51	26
Internal Link Dist (ft)		589			503		673		1499
Turn Bay Length (ft)	450		300	250				100	
Base Capacity (vph)	449	1514	756	266	1061	641	582	198	844
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.37	0.19	0.31	0.40	0.57	0.25	0.29	0.09

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3343	1495	1687	3329		3183	1603		1626	3161	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3343	1495	1687	3329		3183	1603		1626	3161	
Volume (vph)	257	521	134	72	343	33	303	62	57	45	51	12
Peak-hour factor, PHF	0.93	0.93	0.93	0.88	0.88	0.88	0.83	0.83	0.83	0.79	0.79	0.79
Adj. Flow (vph)	276	560	144	82	390	38	365	75	69	57	65	15
RTOR Reduction (vph)	0	0	86	0	9	0	0	46	0	0	14	0
Lane Group Flow (vph)	276	560	58	82	419	0	365	98	0	57	66	0
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	10%	10%	10%	11%	11%	11%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	15.8	23.5	23.5	4.6	12.3		10.3	10.3		3.6	4.3	
Effective Green, g (s)	16.0	24.1	24.1	4.8	12.9		10.5	11.6		3.8	4.9	
Actuated g/C Ratio	0.27	0.40	0.40	0.08	0.21		0.17	0.19		0.06	0.08	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	443	1336	598	134	712		554	308		102	257	
v/s Ratio Prot	c0.17	0.17		0.05	c0.13		c0.11	c0.06		0.04	0.02	
v/s Ratio Perm			0.04									
v/c Ratio	0.62	0.42	0.10	0.61	0.59		0.66	0.32		0.56	0.26	
Uniform Delay, d1	19.5	13.1	11.3	26.8	21.3		23.2	20.9		27.4	26.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.7	0.2	0.1	8.0	1.2		2.8	0.6		6.5	0.5	
Delay (s)	22.2	13.3	11.4	34.9	22.6		26.1	21.5		33.9	26.5	
Level of Service	C	B	B	C	C		C	C		C	C	
Approach Delay (s)		15.5			24.5			24.8			29.6	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	3	4	12	85	53	1
Peak Hour Factor	0.58	0.58	0.78	0.78	0.75	0.75
Hourly flow rate (vph)	5	7	15	109	71	1

Direction, Lane #	SE 1	SE 2	NE 1	NE 2	SW 1	SW 2
Volume Total (vph)	5	7	15	109	71	1
Volume Left (vph)	5	0	15	0	0	0
Volume Right (vph)	0	7	0	0	0	1
Hadj (s)	0.53	-0.67	0.55	0.05	0.03	-0.67
Departure Headway (s)	5.5	4.3	5.1	4.6	4.6	3.9
Degree Utilization, x	0.01	0.01	0.02	0.14	0.09	0.00
Capacity (veh/h)	628	796	695	765	768	903
Control Delay (s)	7.3	6.1	7.0	7.2	6.9	5.8
Approach Delay (s)	6.6		7.2		6.9	
Approach LOS	A		A		A	

Intersection Summary			
Delay	7.0		
HCM Level of Service	A		
Intersection Capacity Utilization	17.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	30	78	17	22	21	33
Peak Hour Factor	0.82	0.82	0.89	0.89	0.75	0.75
Hourly flow rate (vph)	37	95	19	25	28	44
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	131	31			44	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	131	31			44	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	91			98	
cM capacity (veh/h)	845	1040			1558	

Direction, Lane #	NW 1	NE 1	SW 1
Volume Total	132	44	72
Volume Left	37	0	28
Volume Right	95	25	0
cSH	977	1700	1558
Volume to Capacity	0.13	0.03	0.02
Queue Length 95th (ft)	12	0	1
Control Delay (s)	9.3	0.0	2.9
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	2.9
Approach LOS	A		

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	2	24	10	1	52	13
Peak Hour Factor	0.81	0.81	0.69	0.69	0.86	0.86
Hourly flow rate (vph)	2	30	14	1	60	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	151	15			16	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	151	15			16	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	100	97			96	
cM capacity (veh/h)	787	1036			1595	

Direction, Lane #	NW 1	NE 1	SW 1
Volume Total	32	16	76
Volume Left	2	0	60
Volume Right	30	1	0
cSH	1011	1700	1595
Volume to Capacity	0.03	0.01	0.04
Queue Length 95th (ft)	2	0	3
Control Delay (s)	8.7	0.0	5.9
Lane LOS	A		A
Approach Delay (s)	8.7	0.0	5.9
Approach LOS	A		

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	20.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	47	83	31	19	19	48
Peak Hour Factor	0.88	0.88	0.89	0.89	0.84	0.84
Hourly flow rate (vph)	53	94	35	21	23	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	142	51	80			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	142	51	80			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	91	98			
cM capacity (veh/h)	824	1008	1518			

Direction, Lane #	SE 1	NE 1	SW 1
Volume Total	148	56	80
Volume Left	53	35	0
Volume Right	94	0	57
cSH	933	1518	1700
Volume to Capacity	0.16	0.02	0.05
Queue Length 95th (ft)	14	2	0
Control Delay (s)	9.6	4.7	0.0
Lane LOS	A	A	
Approach Delay (s)	9.6	4.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	224	270	415	69	287
v/c Ratio	0.57	0.24	0.38	0.31	0.23
Control Delay	10.8	8.3	2.6	16.8	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	10.8	8.3	2.6	16.8	2.8
Queue Length 50th (ft)	7	20	0	9	1
Queue Length 95th (ft)	50	98	39	m26	m82
Internal Link Dist (ft)	937	792			278
Turn Bay Length (ft)				70	
Base Capacity (vph)	480	1122	1102	225	1244
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.24	0.38	0.31	0.23

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		0.88						1.00	0.85	1.00	1.00	
Flt Protected		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1375						1743	1482	1612	1696	
Flt Permitted		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1375						1743	1482	1612	1696	
Volume (vph)	23	1	182	0	0	0	0	238	365	60	250	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.88	0.88	0.88	0.87	0.87	0.87
Adj. Flow (vph)	25	1	198	0	0	0	0	270	415	69	287	0
RTOR Reduction (vph)	0	170	0	0	0	0	0	0	184	0	0	0
Lane Group Flow (vph)	0	54	0	0	0	0	0	270	231	69	287	0
Heavy Vehicles (%)	21%	21%	21%	2%	2%	2%	9%	9%	9%	12%	12%	12%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		6.5						26.9	26.9	2.9	34.0	
Effective Green, g (s)		7.1						27.8	27.8	3.1	34.9	
Actuated g/C Ratio		0.14						0.56	0.56	0.06	0.70	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		195						969	824	100	1184	
v/s Ratio Prot		c0.04						0.15		c0.04	0.17	
v/s Ratio Perm									c0.16			
v/c Ratio		0.28						0.28	0.28	0.69	0.24	
Uniform Delay, d1		19.2						5.8	5.8	23.0	2.7	
Progression Factor		1.00						1.00	1.00	0.70	0.67	
Incremental Delay, d2		0.8						0.7	0.8	15.6	0.4	
Delay (s)		19.9						6.5	6.7	31.7	2.3	
Level of Service		B						A	A	C	A	
Approach Delay (s)		19.9			0.0			6.6			8.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	298	241	63	131
v/c Ratio	0.69	0.65	0.06	0.28
Control Delay	24.2	18.9	3.0	17.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	24.2	18.9	3.0	17.5
Queue Length 50th (ft)	72	62	2	28
Queue Length 95th (ft)	110	29	m10	68
Internal Link Dist (ft)	803		278	1416
Turn Bay Length (ft)		100		
Base Capacity (vph)	512	431	995	465
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.58	0.56	0.06	0.28

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	1.00			1.00	
Frt					0.99		1.00	1.00			0.98	
Flt Protected					0.96		0.95	1.00			1.00	
Satd. Flow (prot)					1576		1656	1743			1709	
Flt Permitted					0.96		0.95	1.00			1.00	
Satd. Flow (perm)					1576		1656	1743			1709	
Volume (vph)	0	0	0	211	3	21	207	54	0	0	99	17
Peak-hour factor, PHF	0.92	0.92	0.92	0.79	0.79	0.79	0.86	0.86	0.86	0.88	0.88	0.88
Adj. Flow (vph)	0	0	0	267	4	27	241	63	0	0	112	19
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	11	0
Lane Group Flow (vph)	0	0	0	0	290	0	241	63	0	0	120	0
Heavy Vehicles (%)	2%	2%	2%	14%	14%	14%	9%	9%	9%	9%	9%	9%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					12.9		11.0	27.6			12.4	
Effective Green, g (s)					13.5		11.2	28.5			13.3	
Actuated g/C Ratio					0.27		0.22	0.57			0.27	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					426		371	994			455	
v/s Ratio Prot					c0.18		c0.15	0.04			c0.07	
v/s Ratio Perm												
v/c Ratio					0.68		0.65	0.06			0.26	
Uniform Delay, d1					16.3		17.6	4.8			14.5	
Progression Factor					1.00		0.61	0.49			1.00	
Incremental Delay, d2					4.4		3.8	0.1			1.4	
Delay (s)					20.8		14.6	2.5			15.9	
Level of Service					C		B	A			B	
Approach Delay (s)		0.0			20.8			12.1			15.9	
Approach LOS		A			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	16	25	78	9	11	4	26	22	14	4	29	13
Peak Hour Factor	0.88	0.88	0.88	0.86	0.86	0.86	0.78	0.78	0.78	0.72	0.72	0.72
Hourly flow rate (vph)	18	28	89	10	13	5	33	28	18	6	40	18

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	135	28	79	64
Volume Left (vph)	18	10	33	6
Volume Right (vph)	89	5	18	18
Hadj (s)	-0.26	0.11	0.08	0.10
Departure Headway (s)	4.0	4.5	4.4	4.4
Degree Utilization, x	0.15	0.03	0.10	0.08
Capacity (veh/h)	867	759	779	766
Control Delay (s)	7.7	7.6	7.9	7.8
Approach Delay (s)	7.7	7.6	7.9	7.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	23	13	12	11	17	21
Peak Hour Factor	0.82	0.82	0.64	0.64	0.59	0.59
Hourly flow rate (vph)	28	16	19	17	29	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	101	47	64			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	101	47	64			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	98	99			
cM capacity (veh/h)	881	1017	1525			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	44	36	64
Volume Left	28	19	0
Volume Right	16	0	36
cSH	926	1525	1700
Volume to Capacity	0.05	0.01	0.04
Queue Length 95th (ft)	4	1	0
Control Delay (s)	9.1	3.9	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	3.9	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	AM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 NB
Weaving Seg Location	I-205 Merge to Mossdale Rd Off
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	5
Weaving seg length, L (ft)	2500
Terrain	Level
Weaving type	A
Volume ratio, VR	0.64
Weaving ratio, R	0.01

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	fp	v
V_{o1}	1040	0.90	25	1	1.5	1.2	0.887	1.00	1302
V_{o2}	34	0.90	21	1	1.5	1.2	0.903	1.00	41
V_{w1}	2004	0.90	12	1	1.5	1.2	0.942	1.00	2364
V_{w2}	17	0.90	4	1	1.5	1.2	0.978	1.00	19
V_w				2383	V_{nw}				1343
V									3726

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.21	0.22
Weaving and non-weaving speeds, Si (mi/h)			39.84	60.03

Number of lanes required for unconstrained operation, Nw 3.19
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	45.34
Weaving segment density, D (pc/mi/ln)	16.44
Level of service, LOS	B
Capacity of base condition, c_b (pc/h)	11090
Capacity as a 15-minute flow rate, c (veh/h)	9840
Capacity as a full-hour volume, c_h (veh/h)	8856

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	PM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 NB
Weaving Seg Location	I-205 Merge to Mossdale Rd Off
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	5
Weaving seg length, L (ft)	2500
Terrain	Level
Weaving type	A
Volume ratio, VR	0.68
Weaving ratio, R	0.01

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	fp	v
V_{o1}	1582	0.90	17	1	1.5	1.2	0.920	1.00	1910
V_{o2}	91	0.90	4	1	1.5	1.2	0.978	1.00	103
V_{w1}	3686	0.90	8	1	1.5	1.2	0.960	1.00	4267
V_{w2}	39	0.90	5	0	1.5	1.2	0.976	1.00	44
V_w				4311	V_{nw}				2013
V									6324

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			2.14	0.49
Weaving and non-weaving speeds, Si (mi/h)			32.49	51.97

Number of lanes required for unconstrained operation, Nw 3.55
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	36.89
Weaving segment density, D (pc/mi/ln)	34.28
Level of service, LOS	D
Capacity of base condition, c_b (pc/h)	11090
Capacity as a 15-minute flow rate, c (veh/h)	10202
Capacity as a full-hour volume, c_h (veh/h)	9182

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	AM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 NB
Weaving Seg Location	Mossdale Off to SR-120 Diverge
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	4
Weaving seg length, L (ft)	1620
Terrain	Level
Weaving type	A
Volume ratio, VR	0.48
Weaving ratio, R	0.02

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	fp	v
V_{o1}	1560	0.90	25	1	1.5	1.2	0.887	1.00	1953
V_{o2}	15	0.90	13	1	1.5	1.2	0.937	1.00	17
V_{w1}	1484	0.90	16	1	1.5	1.2	0.924	1.00	1784
V_{w2}	28	0.90	4	1	1.5	1.2	0.978	1.00	31
V_w				1815	V_{nw}				1970
V									3785

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.73	0.28
Weaving and non-weaving speeds, Si (mi/h)			35.16	58.05

Number of lanes required for unconstrained operation, Nw 2.04
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	44.24
Weaving segment density, D (pc/mi/ln)	21.39
Level of service, LOS	C
Capacity of base condition, c_b (pc/h)	7204
Capacity as a 15-minute flow rate, c (veh/h)	6392
Capacity as a full-hour volume, c_h (veh/h)	5753

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	PM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 NB
Weaving Seg Location	Mossdale Off to SR-120 Diverge
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	4
Weaving seg length, L (ft)	1620
Terrain	Level

Weaving type	A
Volume ratio, VR	0.36
Weaving ratio, R	0.03

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	fp	v
V_{o1}	3332	0.90	13	1	1.5	1.2	0.937	1.00	3950
V_{o2}	20	0.90	5	1	1.5	1.2	0.974	1.00	22
V_{w1}	1936	0.90	3	1	1.5	1.2	0.983	1.00	2187
V_{w2}	59	0.90	3	1	1.5	1.2	0.983	1.00	66
V_w				2253	V_{nw}				3972
V									6225

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			2.33	0.38
Weaving and non-weaving speeds, Si (mi/h)			31.50	54.84

Number of lanes required for unconstrained operation, Nw 1.81
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	43.25
Weaving segment density, D (pc/mi/ln)	35.99
Level of service, LOS	E
Capacity of base condition, c_b (pc/h)	7204
Capacity as a 15-minute flow rate, c (veh/h)	6752
Capacity as a full-hour volume, c_h (veh/h)	6077

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	AM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 SB
Weaving Seg Location	SR-120 to Manthey Rd
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	5
Weaving seg length, L (ft)	2200
Terrain	Level

Weaving type	A
Volume ratio, VR	0.42
Weaving ratio, R	0.01

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	fp	v
V_{o1}	2844	0.90	22	1	1.5	1.2	0.899	1.00	3513
V_{o2}	18	0.90	25	1	1.5	1.2	0.887	1.00	22
V_{w1}	2171	0.90	11	1	1.5	1.2	0.946	1.00	2549
V_{w2}	24	0.90	25	1	1.5	1.2	0.887	1.00	30
V_w				2579	V_{nw}				3535
V									6114

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.59	0.26
Weaving and non-weaving speeds, Si (mi/h)			36.24	58.56

Number of lanes required for unconstrained operation, Nw 2.52
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	46.49
Weaving segment density, D (pc/mi/ln)	26.30
Level of service, LOS	C
Capacity of base condition, c_b (pc/h)	10892
Capacity as a 15-minute flow rate, c (veh/h)	9795
Capacity as a full-hour volume, c_h (veh/h)	8815

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	PM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 SB
Weaving Seg Location	SR-120 to Manthey Rd
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	5
Weaving seg length, L (ft)	2200
Terrain	Level
Weaving type	A
Volume ratio, VR	0.49
Weaving ratio, R	0.01

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	fp	v
V_{o1}	1752	0.90	25	1	1.5	1.2	0.887	1.00	2193
V_{o2}	13	0.90	15	1	1.5	1.2	0.929	1.00	15
V_{w1}	1804	0.90	8	1	1.5	1.2	0.960	1.00	2088
V_{w2}	13	0.90	8	1	1.5	1.2	0.960	1.00	15
V_w				2103	V_{nw}				2208
V									4311

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.25	0.20
Weaving and non-weaving speeds, Si (mi/h)			39.43	60.84

Number of lanes required for unconstrained operation, Nw 2.66
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	48.10
Weaving segment density, D (pc/mi/ln)	17.92
Level of service, LOS	B
Capacity of base condition, c_b (pc/h)	10892
Capacity as a 15-minute flow rate, c (veh/h)	9665
Capacity as a full-hour volume, c_h (veh/h)	8698

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	AM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 SB
Weaving Seg Location	Manthey Rd to SR120
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	5
Weaving seg length, L (ft)	2500
Terrain	Level
Weaving type	A
Volume ratio, VR	0.70
Weaving ratio, R	0.01

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	fp	v
V_{o1}	1488	0.90	11	1	1.5	1.2	0.946	1.00	1747
V_{o2}	72	0.90	1	1	1.5	1.2	0.993	1.00	80
V_{w1}	3517	0.90	13	1	1.5	1.2	0.937	1.00	4169
V_{w2}	40	0.90	25	1	1.5	1.2	0.887	1.00	50
V_w				4219	V_{nw}				1827
V									6046

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			2.10	0.48
Weaving and non-weaving speeds, Si (mi/h)			32.76	52.21

Number of lanes required for unconstrained operation, Nw 3.58
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	36.92
Weaving segment density, D (pc/mi/ln)	32.75
Level of service, LOS	D
Capacity of base condition, c_b (pc/h)	11090
Capacity as a 15-minute flow rate, c (veh/h)	10492
Capacity as a full-hour volume, c_h (veh/h)	9443

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JL
Agency/Company	TJKM
Date Performed	11/19/2009
Analysis Time Period	PM Peak Hour

Site Information

Freeway/Dir of Travel	I-5 SB
Weaving Seg Location	Manthey Rd to SR120
Jurisdiction	Lathrop
Analysis Year	2009

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	5
Weaving seg length, L (ft)	2500
Terrain	Level
Weaving type	A
Volume ratio, VR	0.70
Weaving ratio, R	0.01

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	f_p	v
V_{o1}	1055	0.90	14	1	1.5	1.2	0.933	1.00	1256
V_{o2}	25	0.90	0	1	1.5	1.2	0.998	1.00	27
V_{w1}	2501	0.90	10	1	1.5	1.2	0.951	1.00	2923
V_{w2}	28	0.90	11	1	1.5	1.2	0.946	1.00	32
V_w				2955	V_{nw}				1283
V									4238

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.35	0.0020
b (Exhibit 24-6)			2.20	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.48	0.30
Weaving and non-weaving speeds, Si (mi/h)			37.14	57.28

Number of lanes required for unconstrained operation, Nw 3.43
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	41.56
Weaving segment density, D (pc/mi/ln)	20.39
Level of service, LOS	C
Capacity of base condition, c_b (pc/h)	11090
Capacity as a 15-minute flow rate, c (veh/h)	10345
Capacity as a full-hour volume, c_h (veh/h)	9310

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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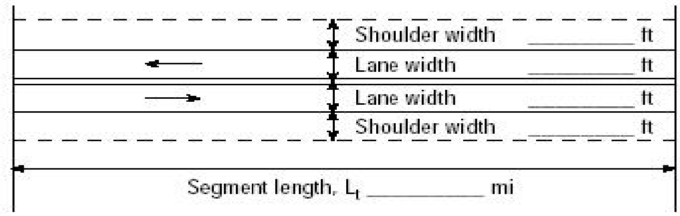
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*Paradise Road*
Agency or Company	*TJKM*	From/To	*Arbor Ave to Paradise Cut*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway	☑ Class II highway
Terrain	☑ Level ☐ Rolling
Two-way hourly volume	*50* veh/h
Directional split	*50 / 50*
Peak-hour factor, PHF	*0.75*
No-passing zone	*0*
% Trucks and Buses , P_T	*0* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*3*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*67*
v_p * highest directional split proportion[2] (pc/h)	*34*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.7 mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.8 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.5 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*39.0*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*67*
v_p * highest directional split proportion[2] (pc/h)	*34*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*5.7*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*0.0*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*5.7*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.02*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*17*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*50*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*0.4*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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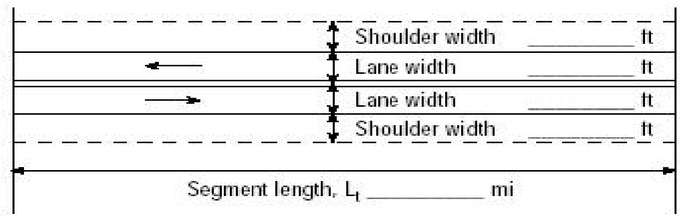
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*Paradise Road*
Agency or Company	*TJKM*	From/To	*Arbor Ave to Paradise Cut*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*72 veh/h*
Directional split	*50 / 50*
Peak-hour factor, PHF	*0.59*
No-passing zone	*0*
% Trucks and Buses , P_T	*3 %*
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*3*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.979*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*125*
v_p * highest directional split proportion[2] (pc/h)	*63*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.7 mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.8 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.5 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*38.6*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.997*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*122*
v_p * highest directional split proportion[2] (pc/h)	*61*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*10.2*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*0.0*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*10.2*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.04*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*31*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*72*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*0.8*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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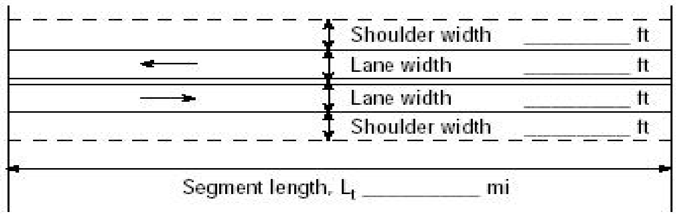
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*JL*	Highway	*Paradise Road*
Agency or Company	*TJKM*	From/To	*Arbor Ave to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway	☑ Class II highway
Terrain	☑ Level ☐ Rolling
Two-way hourly volume	*52* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.70*
No-passing zone	*0*
% Trucks and Buses , P_T	*3* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*3*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.979*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*76*
v_p * highest directional split proportion[2] (pc/h)	*46*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.7 mi/h*
Observed volume, V_f	*veh/h*		
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.8 mi/h*
		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.5 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*39.0*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.997*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*75*
v_p * highest directional split proportion[2] (pc/h)	*45*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*6.4*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*2.3*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*8.7*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.02*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*6*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*16*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*0.2*
Notes	
1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.	

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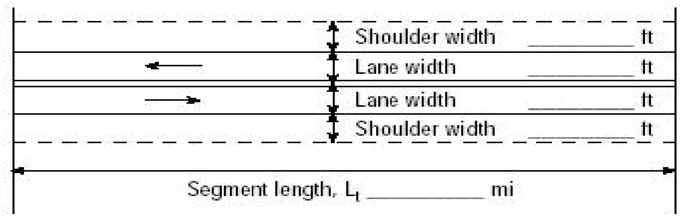
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		**Site Information**	
Analyst	*JL*	Highway	*Paradise Road*
Agency or Company	*TJKM*	From/To	*Arbor Ave to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*53* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.64*
No-passing zone	*0*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*3*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.941*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*88*
v_p * highest directional split proportion[2] (pc/h)	*53*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	*mi/h*	Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Observed volume, V_f	*veh/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.7 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.8 mi/h*
		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.5 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*38.9*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.991*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*84*
v_p * highest directional split proportion[2] (pc/h)	*50*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*7.1*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*2.2*
Percent time-spent-following, PTSF(%)=BPTSF+f $_{d/np}$	*9.4*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.03*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*6*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*16*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*0.2*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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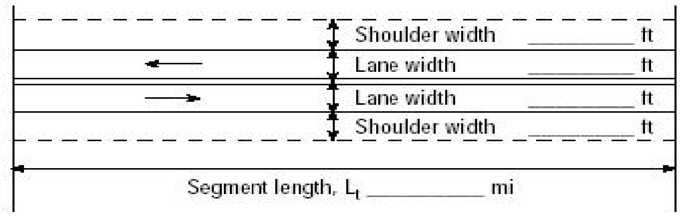
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*JL*	Highway	*Arbor Ave*
Agency or Company	*TJKM*	From/To	*Paradise Rd. to MacArthur Dr.*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*59* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.57*
No-passing zone	*0*
% Trucks and Buses , P_T	*5* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.966*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*107*
v_p * highest directional split proportion[2] (pc/h)	*64*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*45.0* *mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.7* *mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0* *mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.3* *mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*39.5*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.995*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*104*
v_p * highest directional split proportion[2] (pc/h)	*62*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*8.7*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*2.1*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*10.9*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.03*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*41*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*94*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*1.0*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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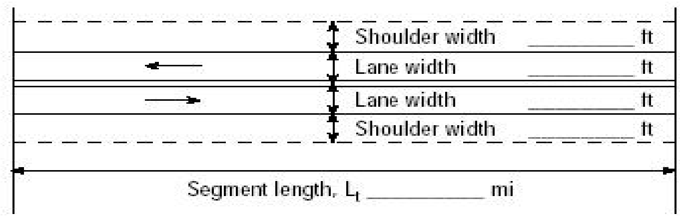
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*JL*	Highway	*Arbor Ave*
Agency or Company	*TJKM*	From/To	*Paradise Rd. to MacArthur Dr.*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway	☑ Class II highway
Terrain ☑ Level	☐ Rolling
Two-way hourly volume	*60 veh/h*
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.82*
No-passing zone	*0*
% Trucks and Buses , P_T	*8 %*
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*0.947*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*77*
v_p * highest directional split proportion[2] (pc/h)	*46*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.7 mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.3 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*39.7*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*0.992*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*74*
v_p * highest directional split proportion[2] (pc/h)	*44*
Base percent time-spent-following, BPTSF(%)=100($1-e^{-0.000879v_p}$)	*6.3*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*2.3*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*8.6*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.02*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*29*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*96*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*0.7*
Notes	
1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.	

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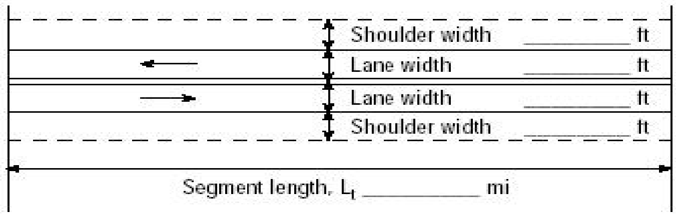
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*MacArthur Dr.*
Agency or Company	*TJKM*	From/To	*Arbor Ave. to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*133* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.89*
No-passing zone	*0*
% Trucks and Buses , P_T	*17* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*0.894*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*167*
v_p * highest directional split proportion[2] (pc/h)	*100*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*60.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.2 mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*55.8 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*54.5*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*0.983*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*152*
v_p * highest directional split proportion[2] (pc/h)	*91*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*12.5*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*1.9*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*14.4*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.05*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*11*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*40*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*0.2*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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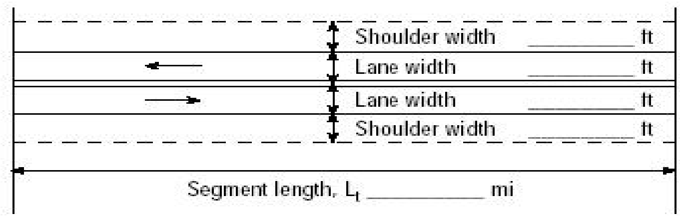
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*MacArthur Dr.*
Agency or Company	*TJKM*	From/To	*Arbor Ave. to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*122* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.77*
No-passing zone	*0*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.941*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*168*
v_p * highest directional split proportion[2] (pc/h)	*101*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	*mi/h*	Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Observed volume, V_f	*veh/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.2 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0 mi/h*
		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.8 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*39.5*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.991*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*160*
v_p * highest directional split proportion[2] (pc/h)	*96*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*13.1*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*1.8*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*14.9*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*A*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.05*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*12*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*37*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*0.3*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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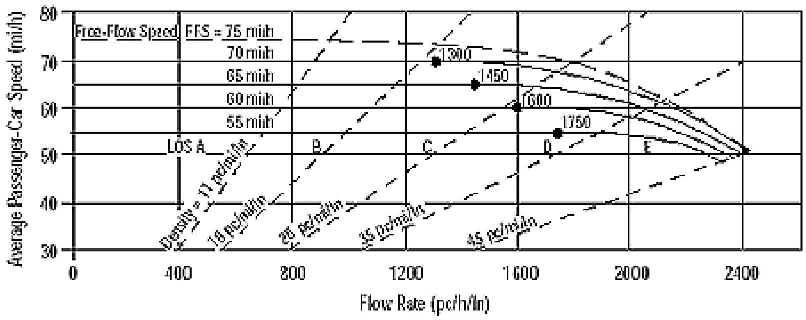
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

(Site Information in right column)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2447*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*967*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*13.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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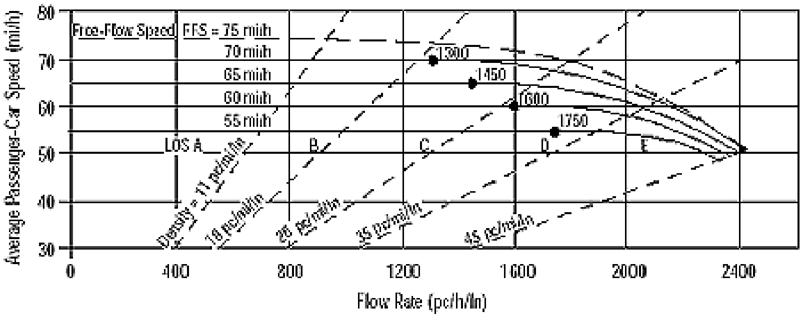
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3733*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1355*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*19.4*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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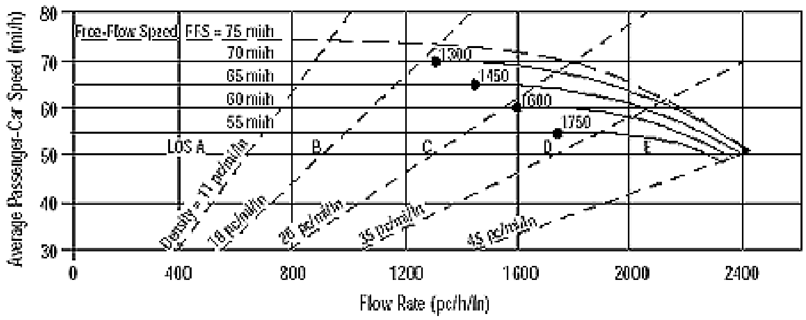
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3286*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1263*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*18.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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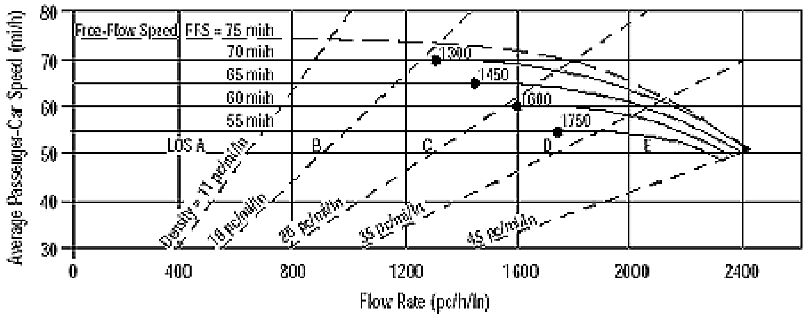
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*
Project Description			

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3258*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1188*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*17.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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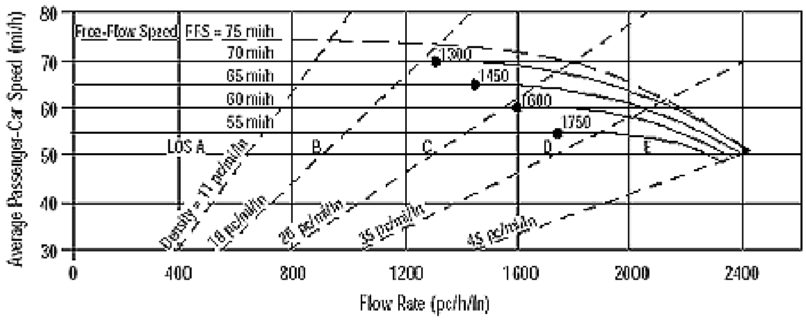
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*SR-120 & Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2440*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*964*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*13.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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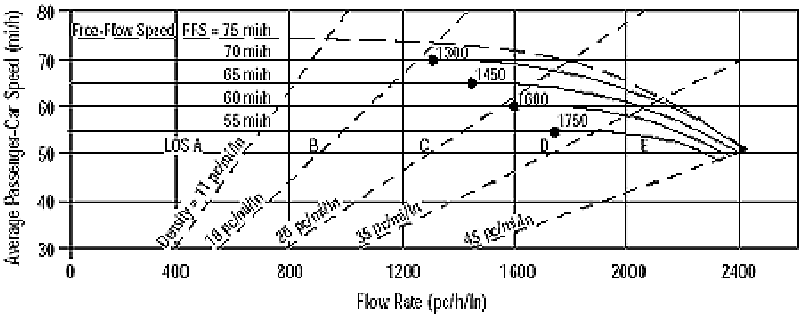
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst		Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*Louise Ave & SR-120*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3873*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1406*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*20.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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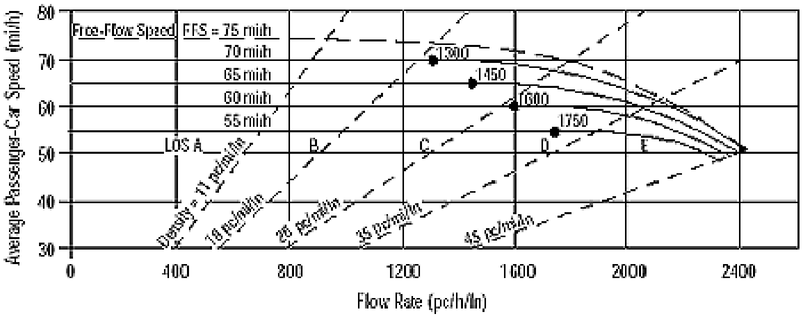
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*Louise Ave & SR-120*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3394*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1304*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*18.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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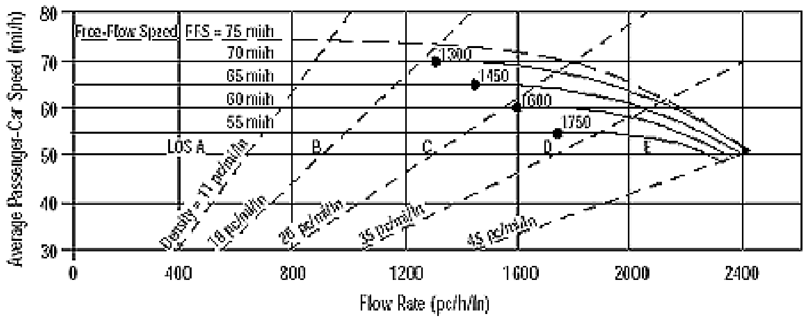

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*Louise Ave & SR-120*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3241*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1182*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*16.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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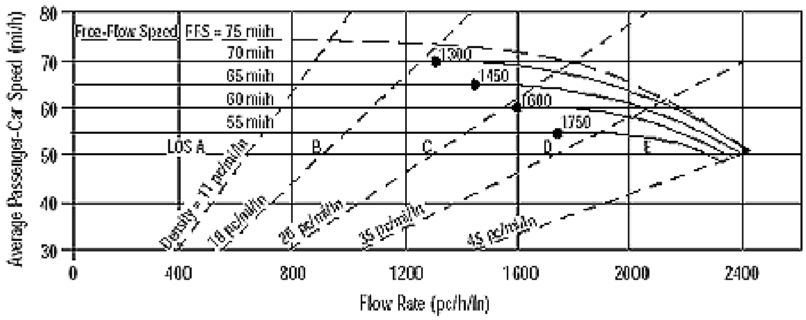
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3087*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*914*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*13.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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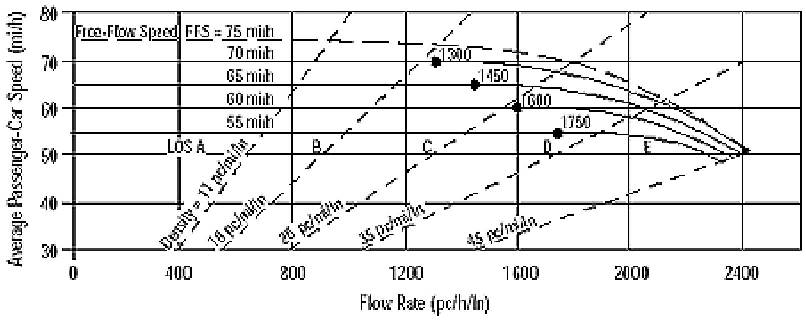
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5347*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1455*	pc/h/ln
S	*69.9*	mi/h
D = v_p / S	*20.8*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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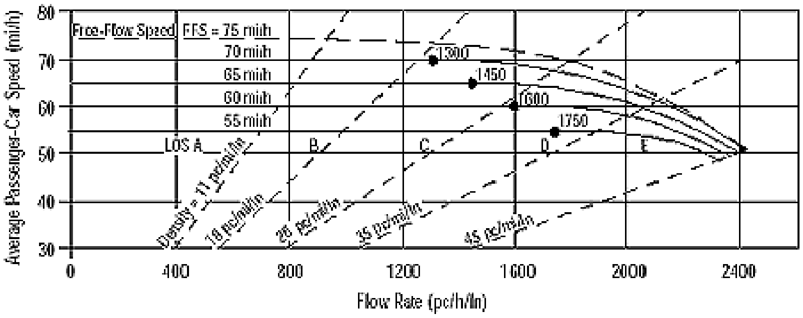
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL	Highway/Direction of Travel	I-5 SB
Agency or Company	TJKM	From/To	SR-120 & Hook Ramps
Date Performed	9/23/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	5583	veh/h	Peak-Hour Factor, PHF	0.93
AADT		veh/day	%Trucks and Buses, P_T	14
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.933

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	5	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1287	pc/h/ln
S	70.0	mi/h
D = v_p / S	18.4	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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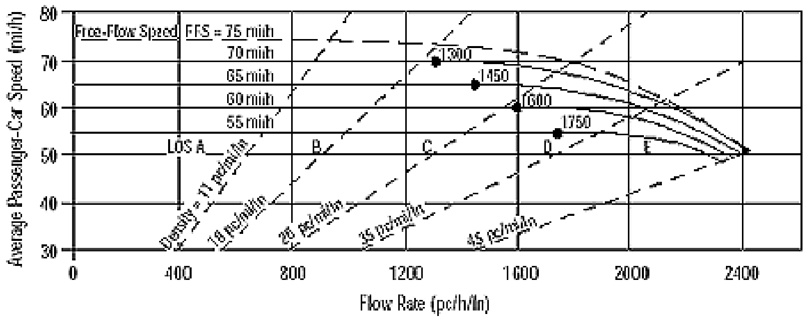
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*SR-120 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3428*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*750*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.7*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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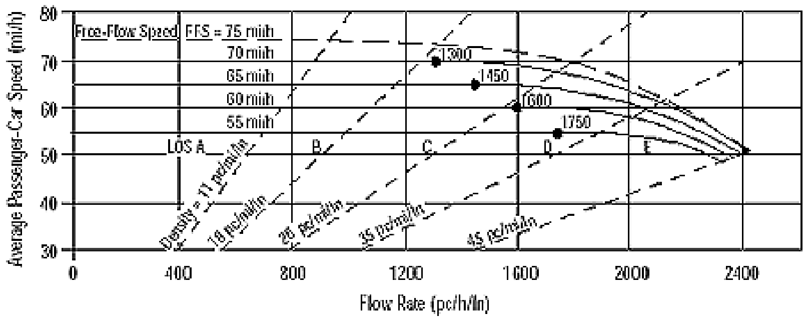
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3095*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*733*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.5*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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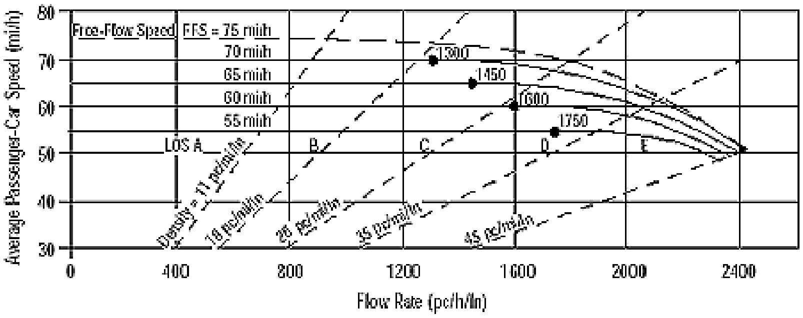
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5398*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1175*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*16.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes; S - Speed
V - Hourly volume; D - Density
v_p - Flow rate; FFS - Free-flow speed
LOS - Level of service; BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10; f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11; f_{LC} - Exhibit 23-5
f_p - Page 23-12; f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3; f_{ID} - Exhibit 23-7

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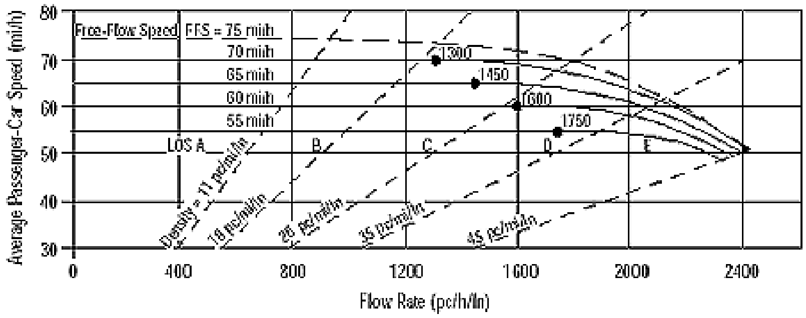
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5653*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1303*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*18.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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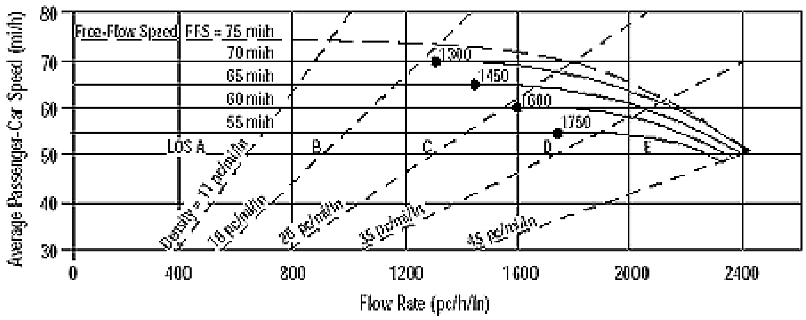
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3455*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*756*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.8*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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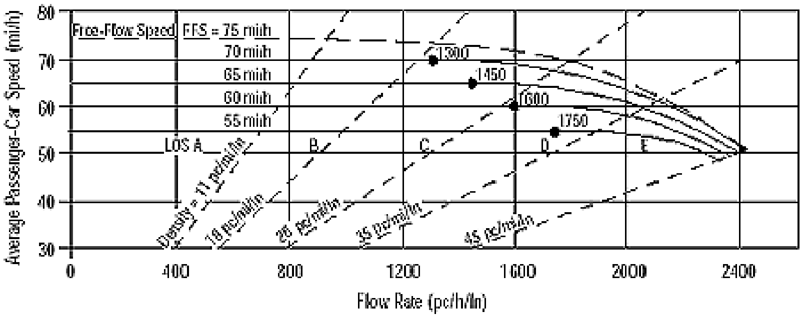
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*South of I-205*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1057*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*2*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*626*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*8.9*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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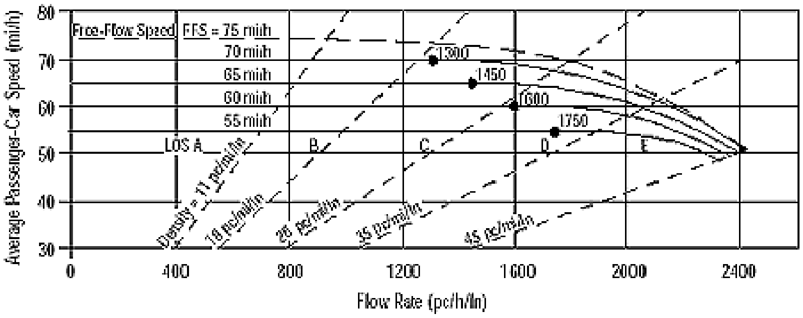

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1621*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*2*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

Operational (LOS)			Design (N)		
			Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*882*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*70.0*	mi/h	S		mi/h
D = v_p / S	*12.6*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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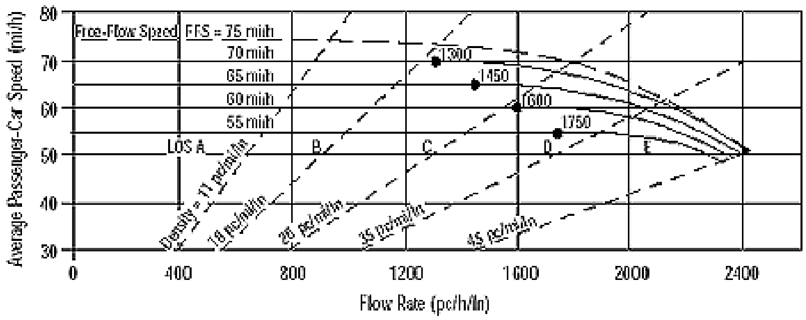
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2181*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*838*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*12.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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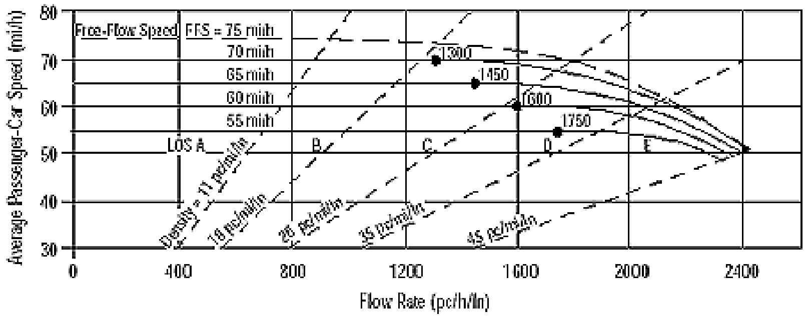
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*South of I-205*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1051*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*383*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*5.5*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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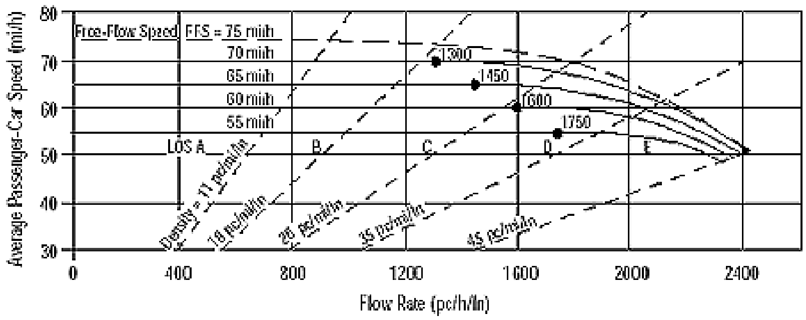
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2038*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*769*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*11.0*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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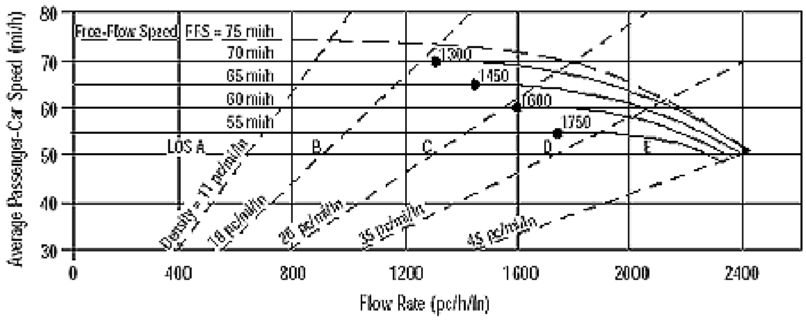

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3777*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1367*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*19.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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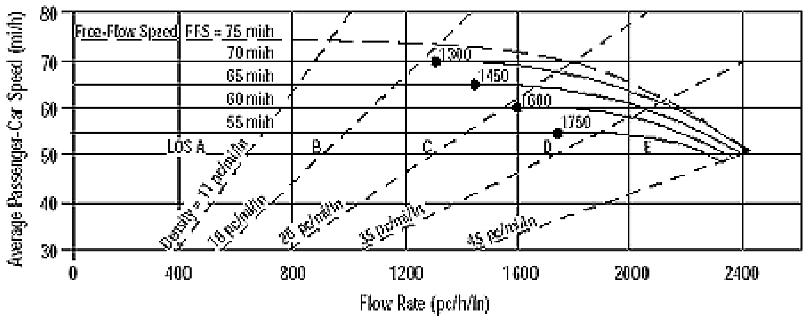

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3472*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1280*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*18.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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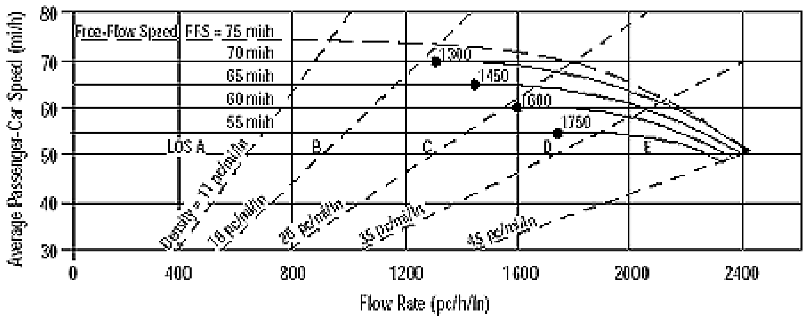

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2404*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*878*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*12.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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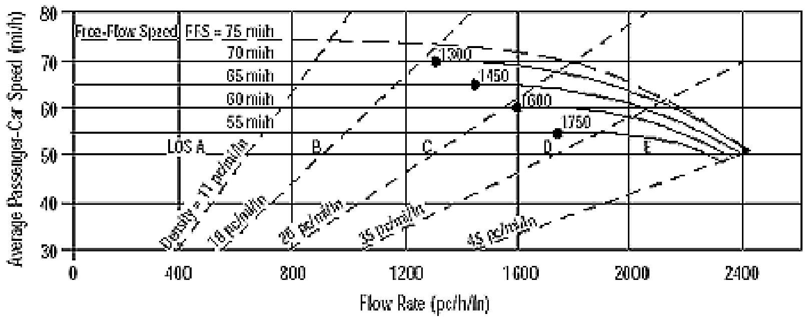

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1957*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*739*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.6*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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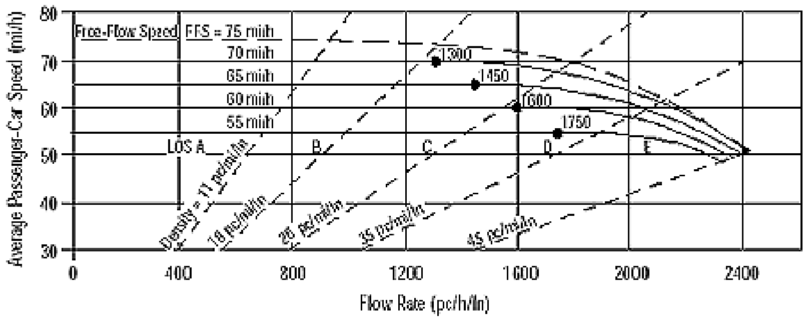

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3696*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1337*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*19.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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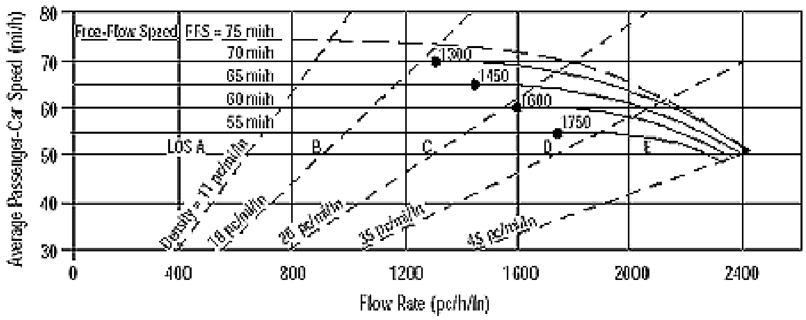
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3335*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1230*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*17.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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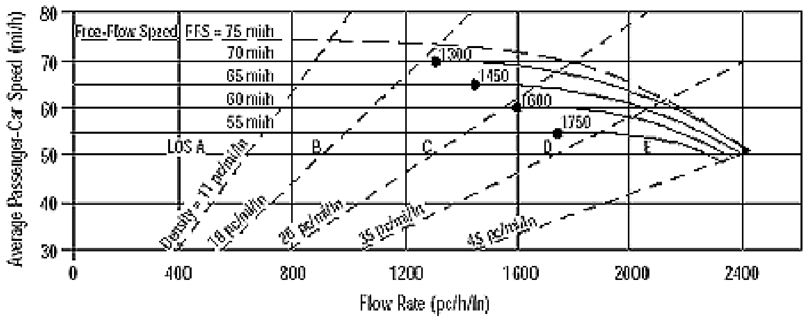
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2396*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*875*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*12.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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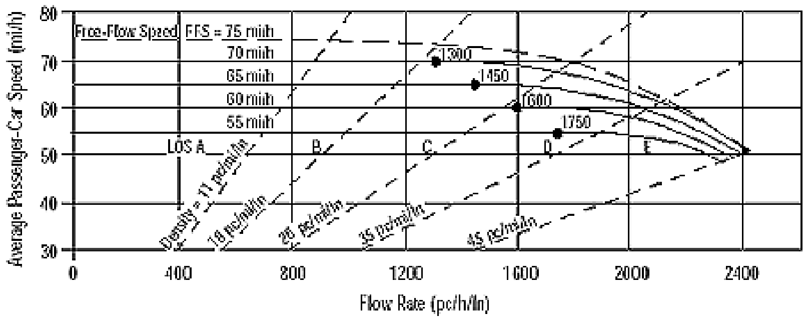
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 EB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2025*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*16*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.924*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*2*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1259*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*18.0*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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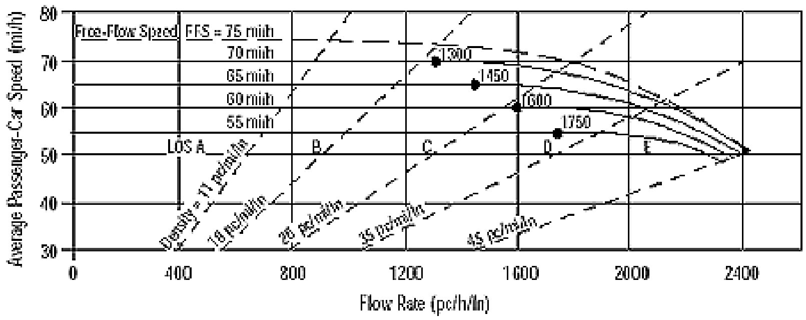
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 EB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3432*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.964*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*2*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1854*	pc/h/ln
S	*67.2*	mi/h
D = v_p / S	*27.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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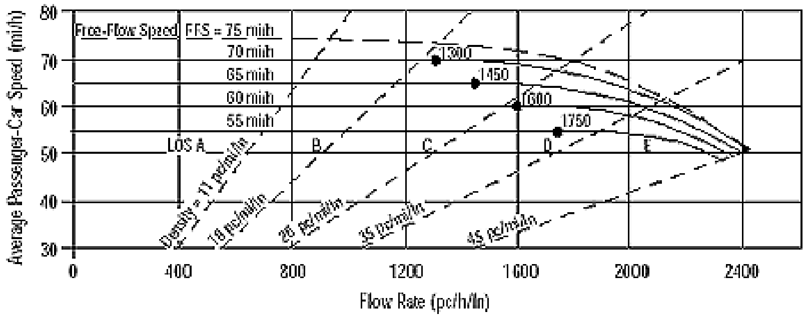
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*SR-120 WB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3041*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*11*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.946*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*2*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1847*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*67.3*	mi/h	S	mi/h
D = v_p / S	*27.4*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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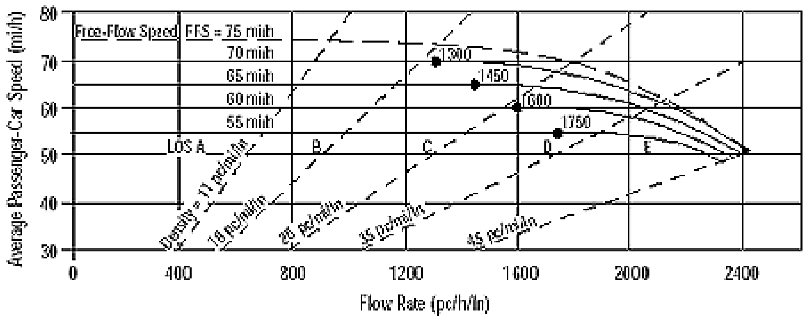
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 WB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2009*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2299*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*2*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1248*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*17.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2900 ft

V_u = 332 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2440	0.90	Level	20	1	0.907	1.00	2988
Ramp	325	0.90	Level	18	1	0.916	1.00	394
UpStream	332	0.90	Level	8	1	0.960	1.00	384
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.584 using Equation (Exhibit 25-5)

V_{12} = 1744 pc/h

V_3 or V_{av34} 1244 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3382	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2138	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 20.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.339 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 52.3 mph (Exhibit 25-19)

S = 51.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2900 ft

V_u = 430 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3873	0.90	Level	13	1	0.937	1.00	4592
Ramp	570	0.90	Level	9	1	0.955	1.00	663
UpStream	430	0.90	Level	6	1	0.969	1.00	493
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.584 using Equation (Exhibit 25-5)

V_{12} = 2680 pc/h

V_3 or V_{av34} 1912 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5255	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3343	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 29.9 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.416 (Exibit 25-19)

S_R= 49.6 mph (Exhibit 25-19)

S_0= 49.9 mph (Exhibit 25-19)

S = 49.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off; L_{down} = 1000 ft; V_D = 325 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2447	0.90	Level	19	1	0.912	1.00	2983
Ramp	332	0.90	Level	8	1	0.960	1.00	384
UpStream								
DownStream	325	0.90	Level	18	1	0.916	1.00	394

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 2844.97 (Equation 25-2 or 25-3)

P_{FM} = 0.652 using Equation (Exhibit 25-5)

V_{12} = 1946 pc/h

V_3 or V_{av34} 1037 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3367	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2330	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 21.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.342 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 53.1 mph (Exhibit 25-19)

S = 51.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 1000 ft

V_D = 570 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3733	0.90	Level	12	1	0.942	1.00	4405
Ramp	430	0.90	Level	6	1	0.969	1.00	493
UpStream								
DownStream	570	0.90	Level	9	1	0.955	1.00	663

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 4787.35 (Equation 25-2 or 25-3)

P_{FM} = 0.723 using Equation (Exhibit 25-5)

V_{12} = 3185 pc/h

V_3 or V_{av34} 1220 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4898	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3678	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 32.2 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.456 (Exibit 25-19)

S_R= 49.1 mph (Exhibit 25-19)

S_0= 52.4 mph (Exhibit 25-19)

S = 49.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2785 ft

V_u = 472 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3286	0.90	Level	14	1	0.933	1.00	3914
Ramp	364	0.90	Level	9	1	0.955	1.00	423
UpStream	472	0.90	Level	13	1	0.937	1.00	560
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.585 using Equation (Exhibit 25-5)

V_{12} = 2289 pc/h

V_3 or V_{av34} 1625 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4337	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2712	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 24.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.362 (Exibit 25-19)

S_R= 50.3 mph (Exhibit 25-19)

S_0= 51.0 mph (Exhibit 25-19)

S = 50.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	374	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☐ No; ☑ On ☐ Off

L_{up} = 2785 ft

V_u = 357 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☑ No; ☐ On ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3258	0.90	Level	13	1	0.937	1.00	3863
Ramp	374	0.90	Level	8	1	0.960	1.00	433
UpStream	357	0.90	Level	16	1	0.924	1.00	429
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.585 using Equation (Exhibit 25-5)

V_{12} = 2259 pc/h

V_3 or V_{av34} 1604 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4296	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2692	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 24.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.360 (Exibit 25-19)

S_R= 50.3 mph (Exhibit 25-19)

S_0= 51.0 mph (Exhibit 25-19)

S = 50.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 2785 ft

V_u = 364 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3394	0.90	Level	14	1	0.933	1.00	4043
Ramp	472	0.90	Level	13	1	0.937	1.00	560
UpStream	364	0.90	Level	9	1	0.955	1.00	423
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 551.33 (Equation 25-2 or 25-3)

P_{FM} = 0.586 using Equation (Exhibit 25-5)

V_{12} = 2370 pc/h

V_3 or V_{av34} 1673 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4603	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2930	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 26.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.372 (Exibit 25-19)

S_R= 50.2 mph (Exhibit 25-19)

S_0= 50.8 mph (Exhibit 25-19)

S = 50.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: Yes ☑ No ☐; On ☐ Off ☑

L_{up} = 2785 ft

V_u = 374 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: Yes ☐ No ☑; On ☐ Off ☐

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3241	0.90	Level	14	1	0.933	1.00	3860
Ramp	357	0.90	Level	16	1	0.924	1.00	429
UpStream	374	0.90	Level	8	1	0.960	1.00	433
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 484.13 (Equation 25-2 or 25-3)

P_{FM} = 0.586 using Equation (Exhibit 25-5)

V_{12} = 2263 pc/h

V_3 or V_{av34} 1597 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4289	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2692	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 24.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.357 (Exibit 25-19)

S_R= 50.4 mph (Exhibit 25-19)

S_0= 51.1 mph (Exhibit 25-19)

S = 50.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Manthey Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 1162 ft

V_u = 112 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5583	0.90	Level	13	1	0.937	1.00	6619
Ramp	42	0.90	Level	25	1	0.887	1.00	53
UpStream	112	0.90	Level	25	1	0.887	1.00	140
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.211 using Equation (Exhibit 25-5)

V_{12} = 1020 pc/h

V_3 or V_{av34} 1906 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1932 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4885	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1985	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 19.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.337 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 51.6 mph (Exhibit 25-19)

S = 51.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Manthey Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 1162 ft

V_u = 53 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3428	0.90	Level	17	1	0.920	1.00	4140
Ramp	26	0.90	Level	12	1	0.942	1.00	31
UpStream	53	0.90	Level	6	1	0.969	1.00	61
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.214 using Equation (Exhibit 25-5)

V_{12} = 691 pc/h

V_3 or V_{av34} 1269 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1292 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3261	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1323	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 14.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.323 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 53.3 mph (Exhibit 25-19)

S = 52.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Manthey Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 1162 ft

V_D = 42 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5653	0.90	Level	13	1	0.937	1.00	6702
Ramp	112	0.90	Level	25	1	0.887	1.00	140
UpStream								
DownStream	42	0.90	Level	25	1	0.887	1.00	53

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.200 using Equation (Exhibit 25-5)

V_{12} = 980 pc/h

V_3 or V_{av34} 1956 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1957 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5033	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2097	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 20.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.340 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 51.5 mph (Exhibit 25-19)

S = 51.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Manthey Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off; L_{down} = 1160 ft; V_D = 26 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3455	0.90	Level	17	1	0.920	1.00	4173
Ramp	53	0.90	Level	6	1	0.969	1.00	61
UpStream								
DownStream	26	0.90	Level	12	1	0.942	1.00	31

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.210 using Equation (Exhibit 25-5)

V_{12} = 684 pc/h

V_3 or V_{av34} 1285 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1302 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3316	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1363	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 14.9 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.323 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 53.3 mph (Exhibit 25-19)

S = 52.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Mossdale Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 1473 ft

V_u = 43 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3095	0.90	Level	21	1	0.903	1.00	3807
Ramp	51	0.90	Level	22	1	0.899	1.00	63
UpStream	43	0.90	Level	7	1	0.964	1.00	50
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.210 using Equation (Exhibit 25-5)

V_{12} = 623 pc/h

V_3 or V_{av34} 1173 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1188 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3033	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1251	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 14.0 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.321 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 53.6 mph (Exhibit 25-19)

S = 52.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Mossdale Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 1473 ft

V_u = 79 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5398	0.90	Level	11	1	0.946	1.00	6340
Ramp	130	0.90	Level	5	1	0.974	1.00	148
UpStream	79	0.90	Level	4	1	0.978	1.00	90
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.199 using Equation (Exhibit 25-5)

V_{12} = 960 pc/h

V_3 or V_{av34} 1929 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1927 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4967	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2075	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 20.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.339 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 51.6 mph (Exhibit 25-19)

S = 51.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Mossdale Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 1473 ft

V_D = 51 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3087	0.90	Level	21	1	0.903	1.00	3797
Ramp	43	0.90	Level	7	1	0.964	1.00	50
UpStream								
DownStream	51	0.90	Level	22	1	0.899	1.00	63

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.212 using Equation (Exhibit 25-5)

V_{12} = 803 pc/h

V_3 or V_{av34} 1497 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1518 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3847	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1568	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 16.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.323 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 52.7 mph (Exhibit 25-19)

S = 51.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Mossdale Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: Yes ☐ On ☐ No ☑ Off ☐

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: Yes ☑ On ☐ No ☐ Off ☑

L_{down} = 1473 ft

V_D = 130 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5347	0.90	Level	11	1	0.946	1.00	6280
Ramp	79	0.90	Level	4	1	0.978	1.00	90
UpStream								
DownStream	130	0.90	Level	5	1	0.974	1.00	148

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.207 using Equation (Exhibit 25-5)

V_{12} = 1297 pc/h

V_3 or V_{av34} 2491 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2512 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6370	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2602	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 24.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.357 (Exibit 25-19)

S_R= 50.4 mph (Exhibit 25-19)

S_0= 50.0 mph (Exhibit 25-19)

S = 50.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: Yes ☑ On ☑ / No ☐ Off ☐

L_{up} = 2000 ft

V_u = 261 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: Yes ☐ On ☐ / No ☑ Off ☐

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1957	0.90	Level	18	1	0.916	1.00	2374
Ramp	180	0.90	Level	25	1	0.887	1.00	225
UpStream	261	0.90	Level	24	1	0.891	1.00	325
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.583 using Equation (Exhibit 25-5)

V_{12} = 1384 pc/h

V_3 or V_{av34} 990 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2599	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1609	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 16.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.326 (Exhibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 53.2 mph (Exhibit 25-19)

S = 51.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2000 ft

V_u = 426 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3696	0.90	Level	9	1	0.955	1.00	4300
Ramp	206	0.90	Level	23	1	0.895	1.00	256
UpStream	426	0.90	Level	9	1	0.955	1.00	496
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.583 using Equation (Exhibit 25-5)

V_{12} = 2507 pc/h

V_3 or V_{av34} 1793 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4556	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2763	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 25.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.369 (Exibit 25-19)

S_R= 50.2 mph (Exhibit 25-19)

S_0= 50.3 mph (Exhibit 25-19)

S = 50.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2000 ft

V_D = 180 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2038	0.90	Level	17	1	0.920	1.00	2461
Ramp	261	0.90	Level	24	1	0.891	1.00	325
UpStream								
DownStream	180	0.90	Level	18	1	0.916	1.00	218

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1562.05 (Equation 25-2 or 25-3)

P_{FM} = 0.585 using Equation (Exhibit 25-5)

V_{12} = 1441 pc/h

V_3 or V_{av34} 1020 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2786	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1766	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 17.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.324 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 53.1 mph (Exhibit 25-19)

S = 51.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2000 ft

V_D = 206 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3777	0.90	Level	8	1	0.960	1.00	4373
Ramp	426	0.90	Level	9	1	0.955	1.00	496
UpStream								
DownStream	206	0.90	Level	23	1	0.895	1.00	256

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1834.34 (Equation 25-2 or 25-3)

P_{FM} = 0.585 using Equation (Exhibit 25-5)

V_{12} = 2560 pc/h

V_3 or V_{av34} 1813 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4869	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3056	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 27.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.384 (Exibit 25-19)

S_R= 50.0 mph (Exhibit 25-19)

S_0= 50.3 mph (Exhibit 25-19)

S = 50.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2100 ft

V_u = 152 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3472	0.90	Level	12	1	0.942	1.00	4097
Ramp	289	0.90	Level	15	1	0.929	1.00	346
UpStream	152	0.90	Level	25	1	0.887	1.00	190
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.583 using Equation (Exhibit 25-5)

V_{12} = 2387 pc/h

V_3 or V_{av34} 1710 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4443	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2733	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 25.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.368 (Exibit 25-19)

S_R= 50.2 mph (Exhibit 25-19)

S_0= 50.6 mph (Exhibit 25-19)

S = 50.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2100 ft

V_u = 227 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2404	0.90	Level	10	1	0.951	1.00	2810
Ramp	235	0.90	Level	14	1	0.933	1.00	280
UpStream	227	0.90	Level	9	1	0.955	1.00	264
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.583 using Equation (Exhibit 25-5)

V_{12} = 1637 pc/h

V_3 or V_{av34} 1173 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3090	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1917	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 19.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.335 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 52.6 mph (Exhibit 25-19)

S = 51.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	MacArthur Dr
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off; L_{down} = 2100 ft; V_D = 289 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3335	0.90	Level	13	1	0.937	1.00	3954
Ramp	152	0.90	Level	25	1	0.887	1.00	190
UpStream								
DownStream	289	0.90	Level	15	1	0.929	1.00	346

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 2441.78 (Equation 25-2 or 25-3)

P_{FM} = 0.592 using Equation (Exhibit 25-5)

V_{12} = 2341 pc/h

V_3 or V_{av34} 1613 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4144	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2531	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 23.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.349 (Exibit 25-19)

S_R= 50.5 mph (Exhibit 25-19)

S_0= 51.0 mph (Exhibit 25-19)

S = 50.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	MacArthur Dr
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2009

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2100 ft

V_D = 235 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2396	0.90	Level	9	1	0.955	1.00	2787
Ramp	227	0.90	Level	9	1	0.955	1.00	264
UpStream								
DownStream	235	0.90	Level	14	0	0.935	1.00	279

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1968.95 (Equation 25-2 or 25-3)

P_{FM} = 0.586 using Equation (Exhibit 25-5)

V_{12} = 1633 pc/h

V_3 or V_{av34} 1154 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3051	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1897	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 18.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.326 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 52.6 mph (Exhibit 25-19)

S = 51.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Appendix D – Projected Area Development (2017 and 2031)

Appendix D - Anticipated Area Development in Vicinity of River Islands Development by Year 2017

Developer	*Occupancy by Year 2017 - Total Units*
Mossdale Village	
Beck (Tracts 3397)	172
Beck (Tracts 3398)	45
Beck (Tracts 3468)	102
KB Homes (Tract 3379)	242
KB Homes (Tract 3380)	151
KB Homes (Tract 3437)	62
KB Homes (Tract 3455)	69
KB Homes (Tract 3438)	78
KB Homes (Tract 3627)	104
KB Homes (Tract 3073)	24
KB Homes (Tract 3447)	41
Lafferty (Tract 3410)	128
Meritage (Tract 3412)	160
Pacific Mtn. Partners (Tracts 3411)	134
Pacific Union (Tract 3225)	66
Syncon (Tracts 3336)	67
Syncon (Tracts 3337)	70
Syncon (Tracts 3338)	66
Syncon (Tracts 3490)	52
TCN - Vallentyne HD Residential	90
TCN- Quierolo South	71
Pulte (Tract 3445)	188
Shea Homes (Tract 3446)	149
Western Pacific (bought by TCN)	42
Sub Total (Mossdale Village)	***2,373***
Central Lathrop - Richland Communities	
Variable Density Residential	2,582
High Density Residential	430
Residential Mixed Use	157
Sub Total (Richland Communities)	***3,169***
GRAND TOTAL	**5,542**

Appendix E – Level of Service Worksheets: Year 2017 Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	230	760	41	1389	1394	351	51	264	699	581	1009	867
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	242	800	43	1462	1467	369	54	278	736	612	1062	913
RTOR Reduction (vph)	0	0	21	0	0	256	0	0	4	0	0	252
Lane Group Flow (vph)	242	800	22	1462	1467	113	54	278	732	612	1062	661
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.3	19.5	19.5	34.2	35.4	35.4	3.4	28.4	62.6	18.9	43.9	43.9
Effective Green, g (s)	18.5	20.8	20.8	34.4	36.7	36.7	3.6	29.7	64.1	19.1	45.2	45.2
Actuated g/C Ratio	0.15	0.17	0.17	0.29	0.31	0.31	0.03	0.25	0.53	0.16	0.38	0.38
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	529	881	274	1430	1555	484	53	1259	1489	794	1915	596
v/s Ratio Prot	0.07	0.16		c0.29	c0.29		c0.03	0.05	0.14	0.12	0.21	
v/s Ratio Perm			0.01			0.07			0.12			c0.42
v/c Ratio	0.46	0.91	0.08	1.02	0.94	0.23	1.02	0.22	0.49	0.77	0.55	1.11
Uniform Delay, d1	46.2	48.7	41.6	42.8	40.6	31.1	58.2	35.9	17.7	48.4	29.5	37.4
Progression Factor	0.85	0.99	1.03	0.91	0.89	0.59	0.68	0.64	1.01	1.00	1.00	1.00
Incremental Delay, d2	0.6	14.2	0.5	13.8	1.6	0.1	123.9	0.1	0.2	4.7	0.4	70.2
Delay (s)	40.1	62.6	43.4	52.9	37.7	18.5	163.5	23.1	18.0	53.0	29.8	107.6
Level of Service	D	E	D	D	D	B	F	C	B	D	C	F
Approach Delay (s)		56.8			42.3			26.7			62.8	
Approach LOS		E			D			C			E	

Intersection Summary			
HCM Average Control Delay	48.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.97	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4704	1375		4456	1263				3155		2561
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4704	1375		4456	1263				3155		2561
Volume (vph)	0	935	1115	0	1829	475	0	0	0	272	0	1668
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	984	1174	0	1925	500	0	0	0	286	0	1756
RTOR Reduction (vph)	0	34	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1205	919	0	1925	500	0	0	0	286	0	1756
Heavy Vehicles (%)	1%	1%	1%	10%	10%	10%	2%	2%	2%	11%	11%	11%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		43.7	120.0		43.7	120.0				66.4		66.4
Effective Green, g (s)		45.0	120.0		45.0	120.0				67.0		67.0
Actuated g/C Ratio		0.38	1.00		0.38	1.00				0.56		0.56
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		1764	1375		1671	1263				1762		1430
v/s Ratio Prot		0.26			c0.43							
v/s Ratio Perm			0.67			0.40				0.09		c0.69
v/c Ratio		0.68	0.67		1.15	0.40				0.16		1.23
Uniform Delay, d1		31.5	0.0		37.5	0.0				12.9		26.5
Progression Factor		0.58	1.00		0.65	1.00				1.00		1.00
Incremental Delay, d2		1.5	1.8		73.2	0.6				0.0		108.8
Delay (s)		19.8	1.8		97.7	0.6				12.9		135.3
Level of Service		B	A		F	A				B		F
Approach Delay (s)		12.1			77.6			0.0			118.2	
Approach LOS		B			E			A			F	

Intersection Summary			
HCM Average Control Delay	68.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	103.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3273	3374			4456	1263	1466	1472	2429			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3273	3374			4456	1263	1466	1472	2429			
Volume (vph)	309	898	0	0	2033	458	271	5	451	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	325	945	0	0	2140	482	285	5	475	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	170	0	0	322	0	0	0
Lane Group Flow (vph)	325	945	0	0	2140	312	143	147	153	0	0	0
Heavy Vehicles (%)	7%	7%	7%	10%	10%	10%	17%	17%	17%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	15.7	93.3			74.1	74.1	16.8	16.8	16.8			
Effective Green, g (s)	15.9	94.6			74.7	74.7	17.4	17.4	17.4			
Actuated g/C Ratio	0.13	0.79			0.62	0.62	0.14	0.14	0.14			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	434	2660			2774	786	213	213	352			
v/s Ratio Prot	c0.10	0.28			c0.48		0.10	c0.10				
v/s Ratio Perm						0.25			0.06			
v/c Ratio	0.75	0.36			0.77	0.40	0.67	0.69	0.43			
Uniform Delay, d1	50.1	3.7			16.5	11.4	48.6	48.7	46.8			
Progression Factor	0.59	0.23			0.28	0.15	1.00	1.00	1.00			
Incremental Delay, d2	5.8	0.3			0.2	0.1	8.1	9.2	0.9			
Delay (s)	35.4	1.2			4.8	1.9	56.6	58.0	47.7			
Level of Service	D	A			A	A	E	E	D			
Approach Delay (s)		9.9			4.2			51.3			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1626	4673	1455	1671	4758		2993	1565		1480	2903	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1626	4673	1455	1671	4758		2993	1565		1480	2903	
Volume (vph)	154	801	265	121	1911	127	522	301	96	189	405	59
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	162	843	279	127	2012	134	549	317	101	199	426	62
RTOR Reduction (vph)	0	0	209	0	6	0	0	9	0	0	10	0
Lane Group Flow (vph)	162	843	70	127	2140	0	549	409	0	199	478	0
Heavy Vehicles (%)	11%	11%	11%	8%	8%	8%	17%	17%	17%	22%	22%	22%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	10.8	29.3	29.3	30.9	49.4		21.7	26.7		14.8	20.5	
Effective Green, g (s)	11.0	29.9	29.9	31.1	50.0		21.9	28.0		15.0	21.1	
Actuated g/C Ratio	0.09	0.25	0.25	0.26	0.42		0.18	0.23		0.12	0.18	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	149	1164	363	433	1983		546	365		185	510	
v/s Ratio Prot	c0.10	0.18		0.08	c0.45		0.18	c0.26		0.13	c0.16	
v/s Ratio Perm			0.05									
v/c Ratio	1.09	0.72	0.19	0.29	1.08		1.01	1.12		1.08	0.94	
Uniform Delay, d1	54.5	41.3	35.5	35.6	35.0		49.0	46.0		52.5	48.8	
Progression Factor	0.86	0.80	1.18	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	95.0	3.5	1.0	0.4	45.3		39.9	83.7		87.7	24.9	
Delay (s)	141.8	36.4	42.9	36.0	80.3		88.9	129.7		140.2	73.7	
Level of Service	F	D	D	D	F		F	F		F	E	
Approach Delay (s)		51.1			77.8			106.6			93.0	
Approach LOS		D			E			F			F	

Intersection Summary			
HCM Average Control Delay	78.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	206	71	39	4	36	71	62	628	13	31	1707	258
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	217	75	41	4	38	75	65	661	14	33	1797	272
RTOR Reduction (vph)	0	0	32	0	0	69	0	0	7	0	0	89
Lane Group Flow (vph)	217	75	9	4	38	6	65	661	7	33	1797	183
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	15.8	23.9	23.9	0.9	9.0	9.0	10.6	55.2	55.2	21.0	65.6	65.6
Effective Green, g (s)	16.0	25.2	25.2	1.1	10.3	10.3	10.8	56.5	56.5	21.2	66.9	66.9
Actuated g/C Ratio	0.13	0.21	0.21	0.01	0.09	0.09	0.09	0.47	0.47	0.18	0.56	0.56
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	236	391	332	16	160	239	159	1666	745	313	1973	883
v/s Ratio Prot	c0.12	c0.04		0.00	0.02		0.04	c0.19		0.02	c0.51	
v/s Ratio Perm			0.01			0.00			0.00			0.12
v/c Ratio	0.92	0.19	0.03	0.25	0.24	0.03	0.41	0.40	0.01	0.11	0.91	0.21
Uniform Delay, d1	51.4	39.0	37.7	59.0	51.2	50.3	51.6	20.7	16.9	41.4	23.9	13.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.95	0.81	0.51	0.23	0.00
Incremental Delay, d2	36.9	0.2	0.0	8.1	0.8	0.0	1.7	0.7	0.0	0.1	4.6	0.3
Delay (s)	88.3	39.3	37.7	67.1	52.0	50.3	47.3	20.4	13.7	21.1	10.2	0.3
Level of Service	F	D	D	E	D	D	D	C	B	C	B	A
Approach Delay (s)		71.0			51.4			22.6			9.1	
Approach LOS		E			D			C			A	

Intersection Summary			
HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.75	1.00	1.00	0.74	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1393	1863	1583	1375	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	69	28	137	22	14	154	15	480	14	35	1693	22
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	73	29	144	23	15	162	16	505	15	37	1782	23
RTOR Reduction (vph)	0	0	116	0	0	145	0	0	4	0	0	5
Lane Group Flow (vph)	73	29	28	23	15	17	16	505	11	37	1782	18
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	11.4	11.4	11.4	11.4	11.4	11.4	3.1	88.2	88.2	5.6	90.7	90.7
Effective Green, g (s)	12.7	12.7	12.7	12.7	12.7	12.7	3.3	89.5	89.5	5.8	92.0	92.0
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11	0.11	0.03	0.75	0.75	0.05	0.77	0.77
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	147	197	168	146	197	168	49	2640	1181	86	2713	1214
v/s Ratio Prot		0.02			0.01		0.01	0.14		c0.02	c0.50	
v/s Ratio Perm	c0.05		0.02	0.02		0.01			0.01			0.01
v/c Ratio	0.50	0.15	0.17	0.16	0.08	0.10	0.33	0.19	0.01	0.43	0.66	0.01
Uniform Delay, d1	50.6	48.7	48.8	48.8	48.4	48.5	57.3	4.5	3.9	55.5	6.6	3.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.35	0.10	0.00
Incremental Delay, d2	2.6	0.3	0.5	0.5	0.2	0.3	3.9	0.2	0.0	1.7	0.6	0.0
Delay (s)	53.3	49.1	49.3	49.3	48.5	48.8	61.1	4.7	3.9	76.9	1.3	0.0
Level of Service	D	D	D	D	D	D	E	A	A	E	A	A
Approach Delay (s)		50.4			48.8			6.3			2.8	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.75	1.00	1.00	0.76	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1393	1863	1583	1407	1863	1583
Volume (vph)	20	569	38	93	2171	48	54	4	214	153	14	115
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	599	40	98	2285	51	57	4	225	161	15	121
RTOR Reduction (vph)	0	0	14	0	0	12	0	0	192	0	0	58
Lane Group Flow (vph)	21	599	26	98	2285	39	57	4	33	161	15	63
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	1.7	77.7	77.7	11.1	87.1	87.1	16.4	16.4	16.4	16.4	16.4	16.4
Effective Green, g (s)	1.9	79.0	79.0	11.3	88.4	88.4	17.7	17.7	17.7	17.7	17.7	17.7
Actuated g/C Ratio	0.02	0.66	0.66	0.09	0.74	0.74	0.15	0.15	0.15	0.15	0.15	0.15
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	28	2330	1042	167	2607	1166	205	275	233	208	275	233
v/s Ratio Prot	0.01	0.17		c0.06	c0.65			0.00			0.01	
v/s Ratio Perm			0.02			0.02	0.04		0.02	c0.11		0.04
v/c Ratio	0.75	0.26	0.03	0.59	0.88	0.03	0.28	0.01	0.14	0.77	0.05	0.27
Uniform Delay, d1	58.8	8.4	7.1	52.1	11.7	4.3	45.5	43.7	44.5	49.2	44.0	45.4
Progression Factor	1.00	1.00	1.00	1.17	0.83	0.26	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	71.6	0.3	0.0	1.4	1.3	0.0	0.7	0.0	0.3	16.3	0.1	0.6
Delay (s)	130.4	8.7	7.2	62.3	11.0	1.1	46.2	43.7	44.8	65.5	44.0	46.0
Level of Service	F	A	A	E	B	A	D	D	D	E	D	D
Approach Delay (s)		12.5			12.9			45.1			56.5	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0	4.0	4.0
Lane Util. Factor			1.00	0.95	0.95	1.00
Frt			1.00	1.00	1.00	0.85
Flt Protected			0.95	1.00	1.00	1.00
Satd. Flow (prot)			1770	3539	3539	1583
Flt Permitted			0.07	1.00	1.00	1.00
Satd. Flow (perm)			124	3539	3539	1583
Volume (vph)	0	0	14	560	2335	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	15	589	2458	5
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	15	589	2458	5
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)			60.0	60.0	60.0	60.0
Effective Green, g (s)			60.0	60.0	60.0	60.0
Actuated g/C Ratio			1.00	1.00	1.00	1.00
Clearance Time (s)			4.5	4.5	4.5	4.5
Vehicle Extension (s)			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)			124	3539	3539	1583
v/s Ratio Prot				0.17	c0.69	
v/s Ratio Perm			0.12			0.00
v/c Ratio			0.12	0.17	0.69	0.00
Uniform Delay, d1			0.0	0.0	0.0	0.0
Progression Factor			1.00	1.00	1.00	1.00
Incremental Delay, d2			2.0	0.1	0.6	0.0
Delay (s)			2.0	0.1	0.6	0.0
Level of Service			A	A	A	A
Approach Delay (s)	0.0			0.1	0.6	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	0.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.91						1.00	0.85	1.00	1.00	
Flt Protected		0.98						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1371						2888	1292	1583	1667	
Flt Permitted		0.98						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1371						2888	1292	1583	1667	
Volume (vph)	75	3	162	0	0	0	0	404	249	20	286	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	3	171	0	0	0	0	425	262	21	301	0
RTOR Reduction (vph)	0	141	0	0	0	0	0	0	93	0	0	0
Lane Group Flow (vph)	0	112	0	0	0	0	0	425	169	21	301	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	25%	25%	25%	14%	14%	14%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		10.5						44.2	44.2	1.6	50.0	
Effective Green, g (s)		11.1						45.1	45.1	1.8	50.9	
Actuated g/C Ratio		0.16						0.64	0.64	0.03	0.73	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		217						1861	832	41	1212	
v/s Ratio Prot		c0.08						0.15		c0.01	c0.18	
v/s Ratio Perm									0.13			
v/c Ratio		0.52						0.23	0.20	0.51	0.25	
Uniform Delay, d1		27.0						5.2	5.1	33.7	3.2	
Progression Factor		1.00						1.00	1.00	0.74	1.10	
Incremental Delay, d2		2.1						0.3	0.5	3.8	0.2	
Delay (s)		29.1						5.5	5.6	28.7	3.7	
Level of Service		C						A	A	C	A	
Approach Delay (s)		29.1			0.0			5.5			5.3	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	109.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.96		1.00	1.00			0.88	
Flt Protected					0.97		0.95	1.00			1.00	
Satd. Flow (prot)					1534		1388	2777			1398	
Flt Permitted					0.97		0.95	1.00			1.00	
Satd. Flow (perm)					1534		1388	2777			1398	
Volume (vph)	0	0	0	233	5	99	159	320	0	0	73	860
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	245	5	104	167	337	0	0	77	905
RTOR Reduction (vph)	0	0	0	0	21	0	0	0	0	0	415	0
Lane Group Flow (vph)	0	0	0	0	333	0	167	337	0	0	567	0
Heavy Vehicles (%)	2%	2%	2%	15%	15%	15%	30%	30%	30%	19%	19%	19%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					15.8		9.5	44.7			31.0	
Effective Green, g (s)					16.4		9.7	45.6			31.9	
Actuated g/C Ratio					0.23		0.14	0.65			0.46	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					359		192	1809			637	
v/s Ratio Prot					c0.22		c0.12	0.12			c0.41	
v/s Ratio Perm												
v/c Ratio					0.93		0.87	0.19			0.89	
Uniform Delay, d1					26.2		29.5	4.8			17.5	
Progression Factor					1.00		0.91	0.64			1.32	
Incremental Delay, d2					29.2		30.9	0.2			6.7	
Delay (s)					55.4		57.7	3.3			29.7	
Level of Service					E		E	A			C	
Approach Delay (s)		0.0			55.4			21.4			29.7	
Approach LOS		A			E			C			C	

Intersection Summary			
HCM Average Control Delay	32.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		1.00						1.00	0.85	1.00	1.00	
Flt Protected		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770						1863	1583	1770	1863	
Flt Permitted		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770						1863	1583	1770	1863	
Volume (vph)	727	0	18	0	0	0	0	52	88	32	1203	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	765	0	19	0	0	0	0	55	93	34	1266	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	45	0	0	0
Lane Group Flow (vph)	0	783	0	0	0	0	0	55	48	34	1266	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		51.4						70.5	70.5	4.0	78.7	
Effective Green, g (s)		52.0						71.8	71.8	4.2	80.0	
Actuated g/C Ratio		0.37						0.51	0.51	0.03	0.57	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		657						955	812	53	1065	
v/s Ratio Prot		c0.44						0.03		0.02	c0.68	
v/s Ratio Perm									0.03			
v/c Ratio		1.19						0.06	0.06	0.64	1.19	
Uniform Delay, d1		44.0						17.1	17.1	67.2	30.0	
Progression Factor		1.00						1.00	1.00	1.28	0.34	
Incremental Delay, d2		101.1						0.1	0.1	2.4	85.9	
Delay (s)		145.1						17.2	17.3	88.5	96.0	
Level of Service		F						B	B	F	F	
Approach Delay (s)		145.1			0.0			17.3			95.8	
Approach LOS		F			A			B			F	

Intersection Summary			
HCM Average Control Delay	107.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00		1.00	1.00		1.00	0.88		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1656	3310		1770	3537		1671	2940		1543	2808	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1656	3310		1770	3537		1671	2940		1543	2808	
Volume (vph)	31	244	1	738	731	3	230	190	775	8	497	741
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	257	1	777	769	3	242	200	816	8	523	780
RTOR Reduction (vph)	0	0	0	0	0	0	0	478	0	0	128	0
Lane Group Flow (vph)	33	258	0	777	772	0	242	538	0	8	1175	0
Heavy Vehicles (%)	9%	9%	9%	2%	2%	2%	8%	8%	8%	17%	17%	17%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	4.3	15.6		47.9	59.2		18.2	56.7		0.8	39.3	
Effective Green, g (s)	4.5	16.9		48.1	60.5		18.4	58.0		1.0	40.6	
Actuated g/C Ratio	0.03	0.12		0.34	0.43		0.13	0.41		0.01	0.29	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	53	400		608	1528		220	1218		11	814	
v/s Ratio Prot	0.02	c0.08		c0.44	0.22		c0.14	0.18		0.01	c0.42	
v/s Ratio Perm												
v/c Ratio	0.62	0.64		1.28	0.51		1.10	0.44		0.73	1.36dr	
Uniform Delay, d1	66.9	58.7		45.9	28.9		60.8	29.4		69.4	49.7	
Progression Factor	0.92	0.98		1.00	1.00		0.79	0.40		1.00	1.00	
Incremental Delay, d2	19.6	3.4		137.5	0.3		74.2	0.6		123.5	206.6	
Delay (s)	81.2	60.7		183.4	29.1		122.5	12.4		192.9	256.3	
Level of Service	F	E		F	C		F	B		F	F	
Approach Delay (s)		63.0			106.5			33.6			255.9	
Approach LOS		E			F			C			F	

Intersection Summary			
HCM Average Control Delay	127.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	111.3%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.91		1.00	1.00			1.00	0.85
Flt Protected					0.98		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1665		1770	1863			1863	1583
Flt Permitted					0.98		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1665		1770	1863			1863	1583
Volume (vph)	0	0	0	197	0	417	10	769	0	0	1038	198
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	207	0	439	11	809	0	0	1093	208
RTOR Reduction (vph)	0	0	0	0	51	0	0	0	0	0	0	56
Lane Group Flow (vph)	0	0	0	0	595	0	11	809	0	0	1093	152
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					50.5		1.7	79.6			73.7	73.7
Effective Green, g (s)					51.1		1.9	80.9			75.0	75.0
Actuated g/C Ratio					0.36		0.01	0.58			0.54	0.54
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					608		24	1077			998	848
v/s Ratio Prot					c0.36		0.01	c0.43			c0.59	
v/s Ratio Perm												0.10
v/c Ratio					0.98		0.46	0.75			1.10	0.18
Uniform Delay, d1					43.9		68.5	22.0			32.5	16.7
Progression Factor					1.00		1.28	1.57			0.55	0.28
Incremental Delay, d2					30.6		1.3	0.5			44.6	0.0
Delay (s)					74.5		88.9	35.0			62.4	4.7
Level of Service					E		F	C			E	A
Approach Delay (s)		0.0			74.5			35.7			53.2	
Approach LOS		A			E			D			D	

Intersection Summary			
HCM Average Control Delay	53.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3536	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3536	
Volume (vph)	5	5	5	439	5	5	5	24	164	5	735	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	5	462	5	5	5	25	173	5	774	5
RTOR Reduction (vph)	0	0	5	0	0	4	0	0	77	0	0	0
Lane Group Flow (vph)	5	5	0	462	5	1	5	25	96	5	779	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	0.8	1.3	1.3	16.2	16.7	16.7	0.8	44.4	44.4	1.3	44.9	
Effective Green, g (s)	1.0	1.5	1.5	16.4	16.9	16.9	1.0	44.6	44.6	1.5	45.1	
Actuated g/C Ratio	0.01	0.02	0.02	0.20	0.21	0.21	0.01	0.56	0.56	0.02	0.56	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	22	35	30	704	394	334	22	1039	883	33	1993	
v/s Ratio Prot	c0.00	0.00		c0.13	0.00		0.00	0.01		0.00	c0.22	
v/s Ratio Perm			0.00			0.00			c0.06			
v/c Ratio	0.23	0.14	0.00	0.66	0.01	0.00	0.23	0.02	0.11	0.15	0.39	
Uniform Delay, d1	39.1	38.6	38.5	29.2	25.0	24.9	39.1	7.9	8.3	38.6	9.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.21	0.40	
Incremental Delay, d2	5.2	1.9	0.0	2.2	0.0	0.0	5.2	0.0	0.2	1.9	0.5	
Delay (s)	44.3	40.5	38.6	31.4	25.0	24.9	44.3	8.0	8.6	48.7	4.5	
Level of Service	D	D	D	C	C	C	D	A	A	D	A	
Approach Delay (s)		41.1			31.3			9.4			4.7	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	5	5	735	5	5	24
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	774	5	5	25
RTOR Reduction (vph)	0	5	0	0	0	4
Lane Group Flow (vph)	5	0	774	5	5	21
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	1.3	1.3	64.8	70.3	1.3	66.1
Effective Green, g (s)	1.5	1.5	65.0	70.5	1.5	66.5
Actuated g/C Ratio	0.02	0.02	0.81	0.88	0.02	0.83
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	35	30	1438	1642	33	1395
v/s Ratio Prot	c0.00		c0.44	0.00	c0.00	0.01
v/s Ratio Perm		0.00				0.00
v/c Ratio	0.14	0.00	0.54	0.00	0.15	0.01
Uniform Delay, d1	38.6	38.5	2.5	0.6	38.6	1.2
Progression Factor	1.00	1.00	0.39	0.12	0.92	0.00
Incremental Delay, d2	1.9	0.0	1.4	0.0	2.1	0.0
Delay (s)	40.5	38.6	2.4	0.1	37.7	0.0
Level of Service	D	D	A	A	D	A
Approach Delay (s)	39.5			2.4	6.3	
Approach LOS	D			A	A	

Intersection Summary			
HCM Average Control Delay	3.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	24	5	587	65	224	149
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	25	5	618	68	236	157
RTOR Reduction (vph)	0	0	0	26	0	127
Lane Group Flow (vph)	25	5	618	42	236	30
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	3.0	56.3	49.1	49.1	15.3	15.3
Effective Green, g (s)	3.2	56.5	49.3	49.3	15.5	15.5
Actuated g/C Ratio	0.04	0.71	0.62	0.62	0.19	0.19
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	71	2499	2181	976	343	307
v/s Ratio Prot	c0.01	0.00	c0.17		c0.13	
v/s Ratio Perm				0.03		0.02
v/c Ratio	0.35	0.00	0.28	0.04	0.69	0.10
Uniform Delay, d1	37.4	3.5	7.1	6.1	30.0	26.5
Progression Factor	0.94	0.65	0.24	0.11	1.00	1.00
Incremental Delay, d2	3.0	0.0	0.3	0.1	5.7	0.1
Delay (s)	38.3	2.2	2.0	0.7	35.7	26.7
Level of Service	D	A	A	A	D	C
Approach Delay (s)		32.3	1.9		32.1	
Approach LOS		C	A		C	

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	6	337	1027	40	145	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	6	355	1081	42	153	53
RTOR Reduction (vph)	0	0	0	13	0	45
Lane Group Flow (vph)	6	355	1081	29	153	8
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	1.3	59.8	54.3	54.3	11.8	11.8
Effective Green, g (s)	1.5	60.0	54.5	54.5	12.0	12.0
Actuated g/C Ratio	0.02	0.75	0.68	0.68	0.15	0.15
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	33	2654	2411	1078	266	237
v/s Ratio Prot	0.00	c0.10	c0.31			
v/s Ratio Perm				0.02	c0.09	0.01
v/c Ratio	0.18	0.13	0.45	0.03	0.58	0.03
Uniform Delay, d1	38.6	2.8	5.9	4.1	31.6	29.0
Progression Factor	1.08	0.32	0.56	0.48	1.00	1.00
Incremental Delay, d2	2.4	0.1	0.5	0.0	3.0	0.1
Delay (s)	44.0	1.0	3.8	2.0	34.6	29.1
Level of Service	D	A	A	A	C	C
Approach Delay (s)		1.7	3.7		33.2	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.92		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3468		1770	3537		1770	1723		1770	1591	
Flt Permitted	0.95	1.00		0.95	1.00		0.48	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3468		1770	3537		896	1723		1399	1591	
Volume (vph)	43	417	65	5	947	5	120	5	5	5	5	171
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	439	68	5	997	5	126	5	5	5	5	180
RTOR Reduction (vph)	0	11	0	0	0	0	0	4	0	0	148	0
Lane Group Flow (vph)	45	496	0	5	1002	0	126	6	0	5	37	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	3.6	49.0		4.4	49.8		14.0	14.0		14.0	14.0	
Effective Green, g (s)	3.8	49.2		4.6	50.0		14.2	14.2		14.2	14.2	
Actuated g/C Ratio	0.05	0.62		0.06	0.62		0.18	0.18		0.18	0.18	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	84	2133		102	2211		159	306		248	282	
v/s Ratio Prot	c0.03	0.14		0.00	c0.28			0.00			0.02	
v/s Ratio Perm							c0.14			0.00		
v/c Ratio	0.54	0.23		0.05	0.45		0.79	0.02		0.02	0.13	
Uniform Delay, d1	37.2	6.9		35.6	7.8		31.5	27.2		27.2	27.7	
Progression Factor	0.91	0.66		0.90	0.91		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	0.3		0.2	0.7		23.1	0.0		0.0	0.2	
Delay (s)	40.3	4.8		32.4	7.8		54.6	27.2		27.2	27.9	
Level of Service	D	A		C	A		D	C		C	C	
Approach Delay (s)		7.7			7.9			52.6			27.9	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3441		1770	3529		1770	1624		1770	1591	
Flt Permitted	0.95	1.00		0.95	1.00		0.53	1.00		0.73	1.00	
Satd. Flow (perm)	1770	3441		1770	3529		992	1624		1369	1591	
Volume (vph)	43	235	53	88	242	5	190	5	28	5	5	172
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	247	56	93	255	5	200	5	29	5	5	181
RTOR Reduction (vph)	0	17	0	0	1	0	0	22	0	0	139	0
Lane Group Flow (vph)	45	286	0	93	259	0	200	12	0	5	47	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	5.2	39.6		9.6	44.0		18.2	18.2		18.2	18.2	
Effective Green, g (s)	5.4	39.8		9.8	44.2		18.4	18.4		18.4	18.4	
Actuated g/C Ratio	0.07	0.50		0.12	0.55		0.23	0.23		0.23	0.23	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	119	1712		217	1950		228	374		315	366	
v/s Ratio Prot	c0.03	c0.08		c0.05	0.07			0.01			0.03	
v/s Ratio Perm							c0.20			0.00		
v/c Ratio	0.38	0.17		0.43	0.13		0.88	0.03		0.02	0.13	
Uniform Delay, d1	35.7	11.0		32.5	8.6		29.7	23.9		23.8	24.4	
Progression Factor	1.48	0.35		0.93	0.84		1.06	1.29		1.00	1.00	
Incremental Delay, d2	2.0	0.2		1.3	0.1		29.2	0.0		0.0	0.2	
Delay (s)	54.9	4.1		31.5	7.4		60.8	30.9		23.8	24.6	
Level of Service	D	A		C	A		E	C		C	C	
Approach Delay (s)		10.7			13.7			56.5			24.6	
Approach LOS		B			B			E			C	

Intersection Summary			
HCM Average Control Delay	23.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.85	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3410		1770	1512	1504	1770	1585	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.41	1.00	1.00	0.73	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3410		768	1512	1504	1367	1585	
Volume (vph)	43	148	115	1234	282	91	48	1	64	45	1	171
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	156	121	1299	297	96	51	1	67	47	1	180
RTOR Reduction (vph)	0	0	109	0	29	0	0	29	30	0	158	0
Lane Group Flow (vph)	45	156	12	1299	364	0	51	5	4	47	23	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	5.2	8.0	8.0	49.9	52.7		9.5	9.5	9.5	9.5	9.5	
Effective Green, g (s)	5.4	8.2	8.2	50.1	52.9		9.7	9.7	9.7	9.7	9.7	
Actuated g/C Ratio	0.07	0.10	0.10	0.63	0.66		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	119	363	162	2150	2255		93	183	182	166	192	
v/s Ratio Prot	0.03	c0.04		c0.38	c0.11			0.00			0.01	
v/s Ratio Perm			0.01				c0.07		0.00	0.03		
v/c Ratio	0.38	0.43	0.08	0.60	0.16		0.55	0.03	0.02	0.28	0.12	
Uniform Delay, d1	35.7	33.7	32.5	9.0	5.1		33.1	31.0	31.0	32.0	31.3	
Progression Factor	1.16	1.14	2.31	0.60	0.41		0.61	0.80	0.82	1.00	1.00	
Incremental Delay, d2	2.0	0.8	0.2	1.0	0.1		6.5	0.1	0.1	0.9	0.3	
Delay (s)	43.2	39.3	75.2	6.4	2.2		26.5	24.8	25.6	32.9	31.6	
Level of Service	D	D	E	A	A		C	C	C	C	C	
Approach Delay (s)		53.3			5.5			25.8			31.9	
Approach LOS		D			A			C			C	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3538		1770	1515	1504	1770	1630	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.74	1.00	1.00	0.56	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3538		1374	1515	1504	1052	1630	
Volume (vph)	5	247	5	867	1513	4	71	5	226	2	5	24
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	260	5	913	1593	4	75	5	238	2	5	25
RTOR Reduction (vph)	0	0	4	0	0	0	0	105	105	0	22	0
Lane Group Flow (vph)	5	260	1	913	1597	0	75	19	14	2	8	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	0.8	16.5	16.5	41.7	57.4		9.2	9.2	9.2	9.2	9.2	
Effective Green, g (s)	1.0	16.7	16.7	41.9	57.6		9.4	9.4	9.4	9.4	9.4	
Actuated g/C Ratio	0.01	0.21	0.21	0.52	0.72		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	22	739	330	1798	2547		161	178	177	124	192	
v/s Ratio Prot	0.00	c0.07		0.27	c0.45			0.01			0.00	
v/s Ratio Perm			0.00				c0.05		0.01	0.00		
v/c Ratio	0.23	0.35	0.00	0.51	0.63		0.47	0.11	0.08	0.02	0.04	
Uniform Delay, d1	39.1	27.0	25.1	12.4	5.7		33.0	31.5	31.4	31.2	31.3	
Progression Factor	0.55	0.29	0.27	1.00	1.00		1.00	1.00	1.01	1.00	1.00	
Incremental Delay, d2	5.0	0.3	0.0	1.0	1.2		2.1	0.3	0.2	0.1	0.1	
Delay (s)	26.4	8.2	6.7	13.4	6.9		35.1	31.9	31.9	31.3	31.4	
Level of Service	C	A	A	B	A		D	C	C	C	C	
Approach Delay (s)		8.5			9.3			32.6			31.4	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑		↱
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	459	15	0	2384	0	65
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	483	16	0	2509	0	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.98		0.98	0.98
vC, conflicting volume			499		1738	242
vC1, stage 1 conf vol					483	
vC2, stage 2 conf vol					1255	
vCu, unblocked vol			472		1733	210
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	96
cM capacity (veh/h)			1067		179	1703

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	242	242	16	1255	1255	68
Volume Left	0	0	0	0	0	0
Volume Right	0	0	16	0	0	68
cSH	1700	1700	1700	1700	1700	1703
Volume to Capacity	0.14	0.14	0.01	0.74	0.74	0.04
Queue Length 95th (ft)	0	0	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	7.2
Lane LOS						A
Approach Delay (s)	0.0			0.0		7.2
Approach LOS						A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.88		1.00	0.93		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1611		1770	1632		1770	3297		1770	3539	
Flt Permitted	0.74	1.00		0.72	1.00		0.17	1.00		0.64	1.00	
Satd. Flow (perm)	1375	1611		1348	1632		316	3297		1195	3539	
Volume (vph)	1	5	44	78	5	23	42	90	76	25	1324	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1	5	46	82	5	24	44	95	80	26	1394	1
RTOR Reduction (vph)	0	39	0	0	21	0	0	17	0	0	0	0
Lane Group Flow (vph)	1	12	0	82	8	0	44	158	0	26	1395	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.6	8.6		8.6	8.6		63.0	63.0		63.0	63.0	
Effective Green, g (s)	8.8	8.8		8.8	8.8		63.2	63.2		63.2	63.2	
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.79	0.79		0.79	0.79	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	151	177		148	180		250	2605		944	2796	
v/s Ratio Prot		0.01			0.00			0.05			c0.39	
v/s Ratio Perm	0.00			c0.06			0.14			0.02		
v/c Ratio	0.01	0.07		0.55	0.04		0.18	0.06		0.03	0.50	
Uniform Delay, d1	31.7	31.9		33.7	31.8		2.0	1.9		1.8	2.9	
Progression Factor	1.00	1.00		1.00	1.00		2.62	0.69		0.15	0.10	
Incremental Delay, d2	0.0	0.2		4.4	0.1		1.5	0.0		0.0	0.5	
Delay (s)	31.7	32.1		38.2	31.9		6.9	1.3		0.3	0.8	
Level of Service	C	C		D	C		A	A		A	A	
Approach Delay (s)		32.1			36.5			2.4			0.8	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	4.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰↰	↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	5	44	22	13	5	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	46	23	14	5	5
RTOR Reduction (vph)	0	8	0	0	0	1
Lane Group Flow (vph)	5	38	23	14	5	4
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	1.2	66.1	1.3	6.7	64.9	64.9
Effective Green, g (s)	1.4	66.5	1.5	6.9	65.1	65.1
Actuated g/C Ratio	0.02	0.83	0.02	0.09	0.81	0.81
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	62	1395	64	305	1440	1288
v/s Ratio Prot	0.00	c0.02	c0.01	c0.00	0.00	
v/s Ratio Perm		0.00				0.00
v/c Ratio	0.08	0.03	0.36	0.05	0.00	0.00
Uniform Delay, d1	38.7	1.2	38.8	33.5	1.4	1.4
Progression Factor	1.00	1.00	0.85	0.85	1.00	1.00
Incremental Delay, d2	0.6	0.0	3.4	0.1	0.0	0.0
Delay (s)	39.2	1.2	36.4	28.6	1.4	1.4
Level of Service	D	A	D	C	A	A
Approach Delay (s)	4.9			33.5	1.4	
Approach LOS	A			C	A	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.04		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	17.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1783		1770	1859		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1783		1770	1859		1770	1863	1583
Volume (vph)	5	5	5	6	5	2	2	76	1	5	412	28
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	5	6	5	2	2	80	1	5	434	29
RTOR Reduction (vph)	0	0	3	0	1	0	0	1	0	0	0	17
Lane Group Flow (vph)	5	5	2	6	6	0	2	80	0	5	434	12
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	1.3	34.1	34.1	1.3	34.1		1.2	26.5		1.3	26.6	26.6
Effective Green, g (s)	1.5	34.3	34.3	1.5	34.3		1.4	26.7		1.5	26.8	26.8
Actuated g/C Ratio	0.02	0.43	0.43	0.02	0.43		0.02	0.33		0.02	0.34	0.34
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	33	799	679	33	764		31	620		33	624	530
v/s Ratio Prot	c0.00	0.00		c0.00	c0.00		0.00	0.04		c0.00	c0.23	
v/s Ratio Perm			0.00									0.01
v/c Ratio	0.15	0.01	0.00	0.18	0.01		0.06	0.13		0.15	0.70	0.02
Uniform Delay, d1	38.6	13.1	13.1	38.6	13.1		38.7	18.6		38.6	23.1	17.8
Progression Factor	1.00	0.82	0.77	0.96	1.00		0.56	1.69		1.13	0.73	0.51
Incremental Delay, d2	2.1	0.0	0.0	2.6	0.0		0.8	0.1		2.1	3.4	0.0
Delay (s)	40.6	10.8	10.0	39.7	13.2		22.3	31.4		45.9	20.3	9.1
Level of Service	D	B	B	D	B		C	C		D	C	A
Approach Delay (s)		20.5			25.4			31.2			19.9	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1770		1770	3520		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1770		1770	3520		1770	3539	1583
Volume (vph)	1	5	5	97	2	1	2	359	13	2	1709	10
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1	5	5	102	2	1	2	378	14	2	1799	11
RTOR Reduction (vph)	0	0	5	0	1	0	0	2	0	0	0	1
Lane Group Flow (vph)	1	5	0	102	2	0	2	390	0	2	1799	10
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	0.8	1.2	1.2	11.7	12.1		0.8	49.1		1.2	49.5	49.5
Effective Green, g (s)	1.0	1.4	1.4	11.9	12.3		1.0	49.3		1.4	49.7	49.7
Actuated g/C Ratio	0.01	0.02	0.02	0.15	0.15		0.01	0.62		0.02	0.62	0.62
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	22	33	28	263	272		22	2169		31	2199	983
v/s Ratio Prot	0.00	c0.00		c0.06	0.00		0.00	c0.11		0.00	c0.51	
v/s Ratio Perm			0.00									0.01
v/c Ratio	0.05	0.15	0.00	0.39	0.01		0.09	0.18		0.06	0.82	0.01
Uniform Delay, d1	39.0	38.7	38.6	30.8	28.7		39.1	6.6		38.7	11.7	5.8
Progression Factor	1.36	0.92	0.94	1.00	1.01		0.43	0.10		1.23	0.42	0.33
Incremental Delay, d2	0.9	2.1	0.0	1.0	0.0		1.6	0.2		0.8	3.3	0.0
Delay (s)	54.0	37.9	36.5	31.9	29.1		18.4	0.8		48.5	8.2	1.9
Level of Service	D	D	D	C	C		B	A		D	A	A
Approach Delay (s)		38.7			31.8			0.9			8.2	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	5	14	3	5	10	54	1	8	69	6	45
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	5	15	3	5	11	57	1	8	73	6	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	16			20			85	45	13	42	47	11
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	16			20			85	45	13	42	47	11
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			93	100	99	92	99	96
cM capacity (veh/h)	1602			1596			853	842	1068	949	840	1071

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	20	3	16	66	126
Volume Left	5	0	3	0	57	73
Volume Right	0	15	0	11	8	47
cSH	1602	1700	1596	1700	875	985
Volume to Capacity	0.00	0.01	0.00	0.01	0.08	0.13
Queue Length 95th (ft)	0	0	0	0	6	11
Control Delay (s)	7.3	0.0	7.3	0.0	9.5	9.2
Lane LOS	A		A		A	A
Approach Delay (s)	1.5		1.2		9.5	9.2
Approach LOS					A	A

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	40	5	22	29	5	5	5	941	87	5	1420	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	5	23	31	5	5	5	991	92	5	1495	5
RTOR Reduction (vph)	0	0	22	0	0	5	0	0	29	0	0	2
Lane Group Flow (vph)	42	5	1	31	5	0	5	991	63	5	1495	3
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	5.9	4.3	4.3	2.6	1.0	1.0	9.9	52.2	52.2	0.6	42.9	42.9
Effective Green, g (s)	6.1	4.5	4.5	2.8	1.2	1.2	10.1	52.4	52.4	0.8	43.1	43.1
Actuated g/C Ratio	0.08	0.06	0.06	0.04	0.02	0.02	0.13	0.68	0.68	0.01	0.56	0.56
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	141	110	93	65	29	25	453	2424	1084	19	1994	892
v/s Ratio Prot	c0.02	0.00		c0.02	0.00		0.00	c0.28		0.00	c0.42	
v/s Ratio Perm			0.00			0.00			0.04			0.00
v/c Ratio	0.30	0.05	0.01	0.48	0.17	0.00	0.01	0.41	0.06	0.26	0.75	0.00
Uniform Delay, d1	33.2	34.0	33.9	36.1	37.2	37.1	28.9	5.3	4.0	37.6	12.6	7.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.2	0.1	5.4	2.8	0.0	0.0	0.1	0.0	7.3	1.6	0.0
Delay (s)	34.4	34.1	34.0	41.6	40.0	37.1	28.9	5.4	4.0	44.8	14.2	7.3
Level of Service	C	C	C	D	D	D	C	A	A	D	B	A
Approach Delay (s)		34.2			40.8			5.4			14.3	
Approach LOS		C			D			A			B	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4944		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	4944		3433	5085	1583	1389	1863	1583	1405	1863	1583
Volume (vph)	90	726	164	429	948	3	29	5	31	17	17	443
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	764	173	452	998	3	31	5	33	18	18	466
RTOR Reduction (vph)	0	35	0	0	0	1	0	0	26	0	0	271
Lane Group Flow (vph)	95	902	0	452	998	2	31	5	7	18	18	195
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	7.8	35.1		14.5	41.8	41.8	17.8	17.8	17.8	17.8	17.8	17.8
Effective Green, g (s)	8.0	35.3		14.7	42.0	42.0	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.10	0.44		0.18	0.52	0.52	0.22	0.22	0.22	0.22	0.22	0.22
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	177	2182		631	2670	831	313	419	356	316	419	356
v/s Ratio Prot	0.05	c0.18		c0.13	0.20			0.00			0.01	
v/s Ratio Perm						0.00	0.02		0.00	0.01		c0.12
v/c Ratio	0.54	0.41		0.72	0.37	0.00	0.10	0.01	0.02	0.06	0.04	0.55
Uniform Delay, d1	34.2	15.3		30.7	11.2	9.0	24.6	24.1	24.1	24.3	24.3	27.4
Progression Factor	1.00	1.00		0.90	0.85	0.86	1.00	1.00	1.00	0.56	0.56	1.25
Incremental Delay, d2	3.1	0.6		3.1	0.3	0.0	0.1	0.0	0.0	0.1	0.0	1.4
Delay (s)	37.3	15.9		30.8	9.9	7.8	24.7	24.1	24.2	13.6	13.6	35.5
Level of Service	D	B		C	A	A	C	C	C	B	B	D
Approach Delay (s)		17.8			16.4			24.4			33.9	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5053		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5053		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	338	362	16	987	1085	25	24	10	67	117	292	897
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	356	381	17	1039	1142	26	25	11	71	123	307	944
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	44	0	0	99
Lane Group Flow (vph)	356	392	0	1039	1142	26	25	11	27	123	307	845
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	15.7	15.7		28.2	28.2	80.0	2.4	1.4	29.6	17.9	16.9	32.6
Effective Green, g (s)	15.9	15.9		28.4	28.4	80.0	2.6	1.6	30.0	18.1	17.1	33.0
Actuated g/C Ratio	0.20	0.20		0.36	0.36	1.00	0.03	0.02	0.38	0.23	0.21	0.41
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	682	1004		1219	1805	1583	58	37	1045	400	398	1289
v/s Ratio Prot	0.10	0.08		c0.30	0.22		0.01	0.01	0.01	c0.07	c0.16	c0.13
v/s Ratio Perm						0.02			0.00			0.17
v/c Ratio	0.52	0.39		0.85	0.63	0.02	0.43	0.30	0.03	0.31	0.77	0.66
Uniform Delay, d1	28.7	27.8		23.9	21.5	0.0	38.0	38.6	15.8	25.7	29.6	18.9
Progression Factor	0.59	0.49		0.85	0.80	1.00	1.00	1.00	1.00	0.72	0.70	0.41
Incremental Delay, d2	0.7	1.1		5.0	1.4	0.0	5.1	4.5	0.0	0.3	6.4	0.9
Delay (s)	17.6	14.8		25.2	18.6	0.0	43.0	43.1	15.8	18.9	27.2	8.7
Level of Service	B	B		C	B	A	D	D	B	B	C	A
Approach Delay (s)		16.1			21.5			25.0			13.7	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM Average Control Delay	18.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00		1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5016		1770	5080		1770		1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.72		1.00	0.76	1.00	1.00
Satd. Flow (perm)	1770	5016		1770	5080		1345		1583	1410	1863	1583
Volume (vph)	8	397	40	733	2263	17	13	0	81	12	51	56
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	418	42	772	2382	18	14	0	85	13	54	59
RTOR Reduction (vph)	0	16	0	0	0	0	0	0	78	0	0	54
Lane Group Flow (vph)	8	444	0	772	2400	0	14	0	7	13	54	5
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	0.8	14.2		46.8	60.2		6.4		6.4	6.4	6.4	6.4
Effective Green, g (s)	1.0	14.4		47.0	60.4		6.6		6.6	6.6	6.6	6.6
Actuated g/C Ratio	0.01	0.18		0.59	0.76		0.08		0.08	0.08	0.08	0.08
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2		4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	22	903		1040	3835		111		131	116	154	131
v/s Ratio Prot	0.00	c0.09		c0.44	c0.47						c0.03	
v/s Ratio Perm							0.01		0.00	0.01		0.00
v/c Ratio	0.36	0.49		0.74	0.63		0.13		0.05	0.11	0.35	0.04
Uniform Delay, d1	39.2	29.5		12.1	4.6		34.0		33.8	34.0	34.7	33.8
Progression Factor	0.65	0.52		1.00	1.00		1.00		1.00	1.00	0.99	1.01
Incremental Delay, d2	9.7	1.9		2.9	0.8		0.5		0.2	0.4	1.4	0.1
Delay (s)	35.0	17.1		15.0	5.3		34.5		34.0	34.6	35.8	34.1
Level of Service	C	B		B	A		C		C	C	D	C
Approach Delay (s)		17.4			7.7			34.1			34.9	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	1093	1674	60	824	1010	575	42	1361	2113	397	351	301
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1151	1762	63	867	1063	605	44	1433	2224	418	369	317
RTOR Reduction (vph)	0	0	12	0	0	91	0	0	0	0	0	236
Lane Group Flow (vph)	1151	1762	51	867	1063	514	44	1433	2224	418	369	81
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	38.8	39.8	39.8	46.8	47.8	47.8	7.4	33.6	80.4	10.8	37.0	37.0
Effective Green, g (s)	39.0	41.1	41.1	47.0	49.1	49.1	7.6	34.9	81.9	11.0	38.3	38.3
Actuated g/C Ratio	0.26	0.27	0.27	0.31	0.33	0.33	0.05	0.23	0.55	0.07	0.26	0.26
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	893	1393	434	1564	1664	518	90	1183	1596	366	1298	404
v/s Ratio Prot	0.34	c0.35		0.17	0.21		0.02	0.28	c0.44	c0.08	c0.07	
v/s Ratio Perm			0.03			0.32			0.36			0.05
v/c Ratio	1.29	1.26	0.12	0.55	0.64	0.99	0.49	1.21	1.39	1.14	0.28	0.20
Uniform Delay, d1	55.5	54.4	40.9	42.8	42.9	50.2	69.3	57.6	34.0	69.5	44.8	43.8
Progression Factor	0.89	0.90	0.84	1.02	0.71	0.65	1.11	0.85	1.01	1.00	1.00	1.00
Incremental Delay, d2	130.8	119.8	0.1	0.3	1.4	31.4	1.6	98.4	178.6	91.5	0.1	0.2
Delay (s)	180.1	169.0	34.4	44.0	31.9	63.9	78.4	147.6	213.1	161.0	45.0	44.1
Level of Service	F	F	C	D	C	E	E	F	F	F	D	D
Approach Delay (s)		170.4			43.7			186.1			88.7	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM Average Control Delay	136.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.36		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	123.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.97	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4565	1335		4497	1274				3303		2682
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4565	1335		4497	1274				3303		2682
Volume (vph)	0	2542	2072	0	1205	262	0	0	0	265	0	986
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2676	2181	0	1268	276	0	0	0	279	0	1038
RTOR Reduction (vph)	0	28	0	0	0	0	0	0	0	0	0	99
Lane Group Flow (vph)	0	3359	1470	0	1268	276	0	0	0	279	0	939
Heavy Vehicles (%)	4%	4%	4%	9%	9%	9%	2%	2%	2%	6%	6%	6%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		95.7	150.0		95.7	150.0				44.4		44.4
Effective Green, g (s)		97.0	150.0		97.0	150.0				45.0		45.0
Actuated g/C Ratio		0.65	1.00		0.65	1.00				0.30		0.30
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		2952	1335		2908	1274				991		805
v/s Ratio Prot		0.74			0.28							
v/s Ratio Perm			c1.10			0.22				0.08		0.35
v/c Ratio		1.14	1.10		0.44	0.22				0.28		1.17
Uniform Delay, d1		26.5	75.0		13.0	0.0				40.1		52.5
Progression Factor		0.70	1.00		0.39	1.00				1.00		1.00
Incremental Delay, d2		62.5	46.8		0.2	0.2				0.2		88.4
Delay (s)		81.0	121.8		5.3	0.2				40.3		140.9
Level of Service		F	F		A	A				D		F
Approach Delay (s)		93.3			4.4			0.0			119.6	
Approach LOS		F			A			A			F	

Intersection Summary			
HCM Average Control Delay	80.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3303	3406			4456	1263	1588	1588	2632			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3303	3406			4456	1263	1588	1588	2632			
Volume (vph)	1078	1729	0	0	1089	378	378	0	1168	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1135	1820	0	0	1146	398	398	0	1229	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	236	0	0	13	0	0	0
Lane Group Flow (vph)	1135	1820	0	0	1146	162	199	199	1216	0	0	0
Heavy Vehicles (%)	6%	6%	6%	10%	10%	10%	8%	8%	8%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	42.8	81.7			35.4	35.4	58.4	58.4	58.4			
Effective Green, g (s)	43.0	83.0			36.0	36.0	59.0	59.0	59.0			
Actuated g/C Ratio	0.29	0.55			0.24	0.24	0.39	0.39	0.39			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	947	1885			1069	303	625	625	1035			
v/s Ratio Prot	c0.34	0.53			c0.26		0.13	0.13				
v/s Ratio Perm						0.13			c0.46			
v/c Ratio	1.20	0.97			1.07	0.53	0.32	0.32	1.18			
Uniform Delay, d1	53.5	32.1			57.0	49.7	31.6	31.6	45.5			
Progression Factor	0.69	0.49			0.44	0.43	1.00	1.00	1.00			
Incremental Delay, d2	90.4	2.1			45.2	4.7	0.3	0.3	89.1			
Delay (s)	127.2	17.7			70.4	26.3	31.9	31.9	134.6			
Level of Service	F	B			E	C	C	C	F			
Approach Delay (s)		59.8			59.0			109.5			0.0	
Approach LOS		E			E			F			A	

Intersection Summary			
HCM Average Control Delay	72.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.95		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	4803	1495	1687	4759		3183	1637		1626	3216	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	4803	1495	1687	4759		3183	1637		1626	3216	
Volume (vph)	257	1972	555	157	978	136	303	400	215	188	443	35
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	271	2076	584	165	1029	143	319	421	226	198	466	37
RTOR Reduction (vph)	0	0	240	0	12	0	0	13	0	0	4	0
Lane Group Flow (vph)	271	2076	344	165	1160	0	319	634	0	198	499	0
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	10%	10%	10%	11%	11%	11%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	27.2	55.4	55.4	12.8	41.0		36.7	47.7		15.8	27.5	
Effective Green, g (s)	27.4	56.0	56.0	13.0	41.6		36.9	49.0		16.0	28.1	
Actuated g/C Ratio	0.18	0.37	0.37	0.09	0.28		0.25	0.33		0.11	0.19	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	305	1793	558	146	1320		783	535		173	602	
v/s Ratio Prot	0.16	c0.43		c0.10	0.24		0.10	c0.39		c0.12	0.16	
v/s Ratio Perm			0.23									
v/c Ratio	0.89	1.16	0.62	1.13	0.88		0.41	1.19		1.14	0.83	
Uniform Delay, d1	59.8	47.0	38.3	68.5	51.8		47.4	50.5		67.0	58.6	
Progression Factor	0.99	0.98	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.2	71.7	0.5	113.7	8.5		0.3	101.2		112.6	9.2	
Delay (s)	62.3	117.6	38.7	182.2	60.3		47.7	151.7		179.6	67.8	
Level of Service	E	F	D	F	E		D	F		F	E	
Approach Delay (s)		96.7			75.4			117.4			99.4	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	95.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	104.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	253	49	61	25	104	119	64	2413	18	84	766	239
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	266	52	64	26	109	125	67	2540	19	88	806	252
RTOR Reduction (vph)	0	0	49	0	0	113	0	0	4	0	0	162
Lane Group Flow (vph)	266	52	15	26	109	13	67	2540	15	88	806	90
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	24.8	34.8	34.8	3.7	13.7	13.7	40.5	84.9	84.9	7.6	52.0	52.0
Effective Green, g (s)	25.0	36.1	36.1	3.9	15.0	15.0	40.7	86.2	86.2	7.8	53.3	53.3
Actuated g/C Ratio	0.17	0.24	0.24	0.03	0.10	0.10	0.27	0.57	0.57	0.05	0.36	0.36
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	295	448	381	46	186	279	480	2034	910	92	1258	562
v/s Ratio Prot	c0.15	0.03		0.01	c0.06		0.04	c0.72		c0.05	0.23	
v/s Ratio Perm			0.01			0.00			0.01			0.06
v/c Ratio	0.90	0.12	0.04	0.57	0.59	0.04	0.14	1.25	0.02	0.96	0.64	0.16
Uniform Delay, d1	61.3	44.5	43.7	72.2	64.5	61.0	41.4	31.9	13.7	70.9	40.4	33.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.71	0.54	0.20	1.21	0.38	0.86
Incremental Delay, d2	28.6	0.1	0.0	14.9	4.7	0.1	0.1	113.7	0.0	74.5	2.3	0.5
Delay (s)	89.9	44.6	43.7	87.1	69.2	61.1	29.5	130.8	2.7	160.6	17.5	28.9
Level of Service	F	D	D	F	E	E	C	F	A	F	B	C
Approach Delay (s)		76.0			67.1			127.3			31.0	
Approach LOS		E			E			F			C	

Intersection Summary			
HCM Average Control Delay	94.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.36	1.00	1.00	0.75	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	667	1863	1583	1392	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	31	15	34	18	140	202	211	2263	10	122	645	84
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	16	36	19	147	213	222	2382	11	128	679	88
RTOR Reduction (vph)	0	0	32	0	0	119	0	0	2	0	0	66
Lane Group Flow (vph)	33	16	4	19	147	94	222	2382	9	128	679	22
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	15.7	15.7	15.7	15.7	15.7	15.7	83.5	106.4	106.4	13.1	36.0	36.0
Effective Green, g (s)	17.0	17.0	17.0	17.0	17.0	17.0	83.7	107.7	107.7	13.3	37.3	37.3
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11	0.11	0.56	0.72	0.72	0.09	0.25	0.25
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	76	211	179	158	211	179	988	2541	1137	157	880	394
v/s Ratio Prot		0.01			c0.08		0.13	c0.67		0.07	c0.19	
v/s Ratio Perm	0.05		0.00	0.01		0.06			0.01			0.01
v/c Ratio	0.43	0.08	0.02	0.12	0.70	0.53	0.22	0.94	0.01	0.82	0.77	0.06
Uniform Delay, d1	62.0	59.5	59.1	59.8	64.0	62.7	16.8	18.2	6.0	67.1	52.4	42.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.56	0.31	0.34
Incremental Delay, d2	3.9	0.2	0.1	0.3	9.6	2.8	0.1	8.2	0.0	22.8	5.4	0.2
Delay (s)	66.0	59.6	59.2	60.1	73.6	65.5	16.9	26.5	6.0	60.5	21.7	15.0
Level of Service	E	E	E	E	E	E	B	C	A	E	C	B
Approach Delay (s)		61.9			68.4			25.6			26.6	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM Average Control Delay	30.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.75	1.00	1.00	0.69	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1397	1863	1583	1279	1863	1583
Volume (vph)	133	2464	51	191	872	176	75	59	282	58	11	55
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	140	2594	54	201	918	185	79	62	297	61	12	58
RTOR Reduction (vph)	0	0	10	0	0	85	0	0	143	0	0	51
Lane Group Flow (vph)	140	2594	44	201	918	100	79	62	154	61	12	7
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	39.4	101.1	101.1	17.9	79.6	79.6	16.2	16.2	16.2	16.2	16.2	16.2
Effective Green, g (s)	39.6	102.4	102.4	18.1	80.9	80.9	17.5	17.5	17.5	17.5	17.5	17.5
Actuated g/C Ratio	0.26	0.68	0.68	0.12	0.54	0.54	0.12	0.12	0.12	0.12	0.12	0.12
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	467	2416	1081	214	1909	854	163	217	185	149	217	185
v/s Ratio Prot	0.08	c0.73		c0.11	0.26			0.03			0.01	
v/s Ratio Perm			0.03			0.06	0.06		c0.10	0.05		0.00
v/c Ratio	0.30	1.07	0.04	0.94	0.48	0.12	0.48	0.29	0.83	0.41	0.06	0.04
Uniform Delay, d1	44.1	23.8	7.8	65.4	21.5	17.0	62.0	60.5	64.8	61.5	58.9	58.8
Progression Factor	1.00	1.00	1.00	1.16	0.17	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	38.7	0.0	38.7	0.7	0.2	2.3	0.7	26.1	1.8	0.1	0.1
Delay (s)	44.3	62.5	7.8	114.6	4.3	0.2	64.3	61.3	90.9	63.3	59.0	58.9
Level of Service	D	E	A	F	A	A	E	E	F	E	E	E
Approach Delay (s)		60.5			20.8			81.9			60.9	
Approach LOS		E			C			F			E	

Intersection Summary			
HCM Average Control Delay	51.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0	4.0	4.0
Lane Util. Factor			1.00	0.95	0.95	1.00
Frt			1.00	1.00	1.00	0.85
Flt Protected			0.95	1.00	1.00	1.00
Satd. Flow (prot)			1770	3539	3539	1583
Flt Permitted			0.29	1.00	1.00	1.00
Satd. Flow (perm)			539	3539	3539	1583
Volume (vph)	0	0	37	2641	941	61
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	39	2780	991	64
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	39	2780	991	64
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)			150.0	150.0	150.0	150.0
Effective Green, g (s)			150.0	150.0	150.0	150.0
Actuated g/C Ratio			1.00	1.00	1.00	1.00
Clearance Time (s)			4.5	4.5	4.5	4.5
Vehicle Extension (s)			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)			539	3539	3539	1583
v/s Ratio Prot				c0.79	0.28	
v/s Ratio Perm			0.07			0.04
v/c Ratio			0.07	0.79	0.28	0.04
Uniform Delay, d1			0.0	0.0	0.0	0.0
Progression Factor			1.00	1.00	1.00	1.00
Incremental Delay, d2			0.3	1.8	0.2	0.0
Delay (s)			0.3	1.8	0.2	0.0
Level of Service			A	A	A	A
Approach Delay (s)	0.0			1.8	0.2	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	1.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.90						1.00	0.85	1.00	1.00	
Flt Protected		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1391						3312	1482	1612	1696	
Flt Permitted		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1391						3312	1482	1612	1696	
Volume (vph)	197	1	676	0	0	0	0	461	411	60	450	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	207	1	712	0	0	0	0	485	433	63	474	0
RTOR Reduction (vph)	0	80	0	0	0	0	0	0	329	0	0	0
Lane Group Flow (vph)	0	840	0	0	0	0	0	485	104	63	474	0
Heavy Vehicles (%)	21%	21%	21%	2%	2%	2%	9%	9%	9%	12%	12%	12%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		44.8						18.3	18.3	3.2	25.7	
Effective Green, g (s)		45.4						19.2	19.2	3.4	26.6	
Actuated g/C Ratio		0.57						0.24	0.24	0.04	0.33	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		789						795	356	69	564	
v/s Ratio Prot		c0.60						0.15		0.04	c0.28	
v/s Ratio Perm									0.07			
v/c Ratio		1.06						0.61	0.29	0.91	0.84	
Uniform Delay, d1		17.3						27.1	24.8	38.2	24.7	
Progression Factor		1.00						1.00	1.00	1.09	0.50	
Incremental Delay, d2		50.7						3.5	2.1	15.2	1.5	
Delay (s)		68.0						30.5	26.9	56.7	13.9	
Level of Service		E						C	C	E	B	
Approach Delay (s)		68.0			0.0			28.8			18.9	
Approach LOS		E			A			C			B	

Intersection Summary			
HCM Average Control Delay	41.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.98		1.00	1.00			0.91	
Flt Protected					0.96		0.95	1.00			1.00	
Satd. Flow (prot)					1568		1656	3312			1584	
Flt Permitted					0.96		0.95	1.00			1.00	
Satd. Flow (perm)					1568		1656	3312			1584	
Volume (vph)	0	0	0	211	3	35	207	451	0	0	299	630
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	222	3	37	218	475	0	0	315	663
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	95	0
Lane Group Flow (vph)	0	0	0	0	254	0	218	475	0	0	883	0
Heavy Vehicles (%)	2%	2%	2%	14%	14%	14%	9%	9%	9%	9%	9%	9%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					12.7		10.8	57.8			42.8	
Effective Green, g (s)					13.3		11.0	58.7			43.7	
Actuated g/C Ratio					0.17		0.14	0.73			0.55	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					261		228	2430			865	
v/s Ratio Prot					c0.16		c0.13	0.14			c0.56	
v/s Ratio Perm												
v/c Ratio					0.98		0.96	0.20			1.02	
Uniform Delay, d1					33.2		34.3	3.3			18.2	
Progression Factor					1.00		0.64	2.30			1.00	
Incremental Delay, d2					48.4		37.0	0.1			36.0	
Delay (s)					81.5		58.8	7.7			54.2	
Level of Service					F		E	A			D	
Approach Delay (s)		0.0			81.5			23.8			54.2	
Approach LOS		A			F			C			D	

Intersection Summary			
HCM Average Control Delay	47.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		1.00						1.00	0.85	1.00	1.00	
Flt Protected		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770						1863	1583	1770	1863	
Flt Permitted		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770						1863	1583	1770	1863	
Volume (vph)	1269	0	32	0	0	0	0	221	175	650	198	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1336	0	34	0	0	0	0	233	184	684	208	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	158	0	0	0
Lane Group Flow (vph)	0	1370	0	0	0	0	0	233	26	684	208	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		72.7						18.4	18.4	34.8	57.4	
Effective Green, g (s)		73.3						19.7	19.7	35.0	58.7	
Actuated g/C Ratio		0.52						0.14	0.14	0.25	0.42	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		927						262	223	443	781	
v/s Ratio Prot		c0.77						c0.13		c0.39	0.11	
v/s Ratio Perm									0.02			
v/c Ratio		1.48						0.89	0.12	1.54	0.27	
Uniform Delay, d1		33.4						59.1	52.5	52.5	26.6	
Progression Factor		1.00						1.00	1.00	0.67	0.76	
Incremental Delay, d2		220.7						33.1	1.1	245.8	0.1	
Delay (s)		254.0						92.2	53.6	280.9	20.2	
Level of Service		F						F	D	F	C	
Approach Delay (s)		254.0			0.0			75.2			220.1	
Approach LOS		F			A			E			F	

Intersection Summary			
HCM Average Control Delay	214.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.41		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	237.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.88		1.00	1.00		1.00	0.92		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3048		1770	3531		1736	3177		1671	3041	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3048		1770	3531		1736	3177		1671	3041	
Volume (vph)	413	295	1281	743	697	11	5	1023	1324	5	230	346
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	435	311	1348	782	734	12	5	1077	1394	5	242	364
RTOR Reduction (vph)	0	236	0	0	1	0	0	173	0	0	203	0
Lane Group Flow (vph)	435	1423	0	782	745	0	5	2298	0	5	403	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	8%	8%	8%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	36.7	41.3		29.8	34.4		0.8	49.1		0.8	49.1	
Effective Green, g (s)	36.9	42.6		30.0	35.7		1.0	50.4		1.0	50.4	
Actuated g/C Ratio	0.26	0.30		0.21	0.26		0.01	0.36		0.01	0.36	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	458	927		379	900		12	1144		12	1095	
v/s Ratio Prot	0.25	c0.47		c0.44	0.21		0.00	c0.72		0.00	c0.13	
v/s Ratio Perm												
v/c Ratio	0.95	1.90dr		2.06	0.83		0.42	1.82dr		0.42	0.37	
Uniform Delay, d1	50.6	48.7		55.0	49.3		69.2	44.8		69.2	33.1	
Progression Factor	1.00	1.00		1.00	1.00		1.03	0.87		1.00	1.00	
Incremental Delay, d2	29.3	246.3		487.5	6.3		2.1	454.0		21.8	1.0	
Delay (s)	79.9	295.0		542.5	55.6		73.7	493.0		91.0	34.0	
Level of Service	E	F		F	E		E	F		F	C	
Approach Delay (s)		250.3			304.8			492.1			34.5	
Approach LOS		F			F			F			C	

Intersection Summary			
HCM Average Control Delay	332.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.79		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	171.7%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.88		1.00	1.00			1.00	0.85
Flt Protected					0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1629		1770	1863			1863	1583
Flt Permitted					0.99		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1629		1770	1863			1863	1583
Volume (vph)	0	0	0	118	0	998	140	1350	0	0	730	1523
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	124	0	1051	147	1421	0	0	768	1603
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	0	0	0	577
Lane Group Flow (vph)	0	0	0	0	1163	0	147	1421	0	0	768	1026
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					62.4		8.8	67.7			54.7	54.7
Effective Green, g (s)					63.0		9.0	69.0			56.0	56.0
Actuated g/C Ratio					0.45		0.06	0.49			0.40	0.40
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					733		114	918			745	633
v/s Ratio Prot					c0.71		0.08	c0.76			0.41	
v/s Ratio Perm												c0.65
v/c Ratio					1.59		1.29	1.55			1.03	1.62
Uniform Delay, d1					38.5		65.5	35.5			42.0	42.0
Progression Factor					1.00		1.23	0.36			0.77	2.46
Incremental Delay, d2					270.4		136.3	247.1			19.2	279.9
Delay (s)					308.9		216.6	259.8			51.7	383.3
Level of Service					F		F	F			D	F
Approach Delay (s)		0.0			308.9			255.7			275.9	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	277.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.62		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	237.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3530	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3530	
Volume (vph)	5	5	5	274	5	5	5	849	511	5	261	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	5	288	5	5	5	894	538	5	275	5
RTOR Reduction (vph)	0	0	5	0	0	4	0	0	177	0	1	0
Lane Group Flow (vph)	5	5	0	288	5	1	5	894	361	5	279	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	0.8	1.3	1.3	12.5	13.0	13.0	1.3	58.6	58.6	0.8	58.1	
Effective Green, g (s)	1.0	1.5	1.5	12.7	13.2	13.2	1.5	58.8	58.8	1.0	58.3	
Actuated g/C Ratio	0.01	0.02	0.02	0.14	0.15	0.15	0.02	0.65	0.65	0.01	0.65	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	20	31	26	484	273	232	30	1217	1034	20	2287	
v/s Ratio Prot	0.00	c0.00		c0.08	0.00		0.00	c0.48		0.00	c0.08	
v/s Ratio Perm			0.00			0.00			0.23			
v/c Ratio	0.25	0.16	0.00	0.60	0.02	0.00	0.17	0.73	0.35	0.25	0.12	
Uniform Delay, d1	44.1	43.6	43.5	36.2	32.9	32.8	43.6	10.4	7.0	44.1	6.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.25	
Incremental Delay, d2	6.5	2.4	0.0	2.0	0.0	0.0	2.6	4.0	0.9	6.4	0.1	
Delay (s)	50.6	46.1	43.6	38.2	32.9	32.8	46.3	14.4	7.9	47.8	7.7	
Level of Service	D	D	D	D	C	C	D	B	A	D	A	
Approach Delay (s)		46.7			38.0			12.1			8.4	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	5	5	261	5	5	849
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	275	5	5	894
RTOR Reduction (vph)	0	5	0	0	0	134
Lane Group Flow (vph)	5	0	275	5	5	760
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	1.3	1.3	74.8	80.3	1.3	76.1
Effective Green, g (s)	1.5	1.5	75.0	80.5	1.5	76.5
Actuated g/C Ratio	0.02	0.02	0.83	0.89	0.02	0.85
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	31	26	1475	1666	30	1416
v/s Ratio Prot	c0.00		0.16	0.00	0.00	c0.45
v/s Ratio Perm		0.00				0.03
v/c Ratio	0.16	0.00	0.19	0.00	0.17	0.54
Uniform Delay, d1	43.6	43.5	1.5	0.5	43.6	1.9
Progression Factor	1.00	1.00	0.36	0.25	0.76	13.98
Incremental Delay, d2	2.4	0.0	0.3	0.0	2.0	0.3
Delay (s)	46.1	43.6	0.8	0.1	35.2	26.3
Level of Service	D	D	A	A	D	C
Approach Delay (s)	44.8			0.8	26.4	
Approach LOS	D			A	C	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	158	691	217	295	136	44
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	166	727	228	311	143	46
RTOR Reduction (vph)	0	0	0	130	0	40
Lane Group Flow (vph)	166	727	228	181	143	6
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	13.3	69.6	52.1	52.1	12.0	12.0
Effective Green, g (s)	13.5	69.8	52.3	52.3	12.2	12.2
Actuated g/C Ratio	0.15	0.78	0.58	0.58	0.14	0.14
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	266	2745	2057	920	240	215
v/s Ratio Prot	c0.09	c0.21	0.06		c0.08	
v/s Ratio Perm				0.11		0.00
v/c Ratio	0.62	0.26	0.11	0.20	0.60	0.03
Uniform Delay, d1	35.9	2.9	8.4	8.9	36.6	33.8
Progression Factor	0.90	0.49	0.61	0.30	1.00	1.00
Incremental Delay, d2	3.7	0.2	0.1	0.5	3.9	0.1
Delay (s)	36.1	1.6	5.3	3.1	40.5	33.8
Level of Service	D	A	A	A	D	C
Approach Delay (s)		8.0	4.0		38.9	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	52	1247	712	189	84	12
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	55	1313	749	199	88	13
RTOR Reduction (vph)	0	0	0	58	0	12
Lane Group Flow (vph)	55	1313	749	141	88	1
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	5.7	73.4	63.5	63.5	8.2	8.2
Effective Green, g (s)	5.9	73.6	63.7	63.7	8.4	8.4
Actuated g/C Ratio	0.07	0.82	0.71	0.71	0.09	0.09
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	116	2894	2505	1120	165	148
v/s Ratio Prot	0.03	c0.37	0.21			
v/s Ratio Perm				0.09	c0.05	0.00
v/c Ratio	0.47	0.45	0.30	0.13	0.53	0.01
Uniform Delay, d1	40.6	2.4	4.9	4.2	38.9	37.0
Progression Factor	1.02	0.89	0.43	0.28	1.00	1.00
Incremental Delay, d2	3.0	0.5	0.3	0.2	3.3	0.0
Delay (s)	44.2	2.6	2.4	1.4	42.2	37.0
Level of Service	D	A	A	A	D	D
Approach Delay (s)		4.3	2.2		41.6	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	5.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3495		1770	3536		1770	1723		1770	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.62	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3495		1770	3536		1153	1723		1399	1597	
Volume (vph)	214	1221	110	5	837	5	64	5	5	5	5	93
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	225	1285	116	5	881	5	67	5	5	5	5	98
RTOR Reduction (vph)	0	4	0	0	0	0	0	5	0	0	88	0
Lane Group Flow (vph)	225	1397	0	5	886	0	67	5	0	5	15	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	15.1	67.3		1.4	53.6		8.7	8.7		8.7	8.7	
Effective Green, g (s)	15.3	67.5		1.6	53.8		8.9	8.9		8.9	8.9	
Actuated g/C Ratio	0.17	0.75		0.02	0.60		0.10	0.10		0.10	0.10	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	301	2621		31	2114		114	170		138	158	
v/s Ratio Prot	c0.13	c0.40		0.00	c0.25			0.00			0.01	
v/s Ratio Perm							c0.06			0.00		
v/c Ratio	0.75	0.53		0.16	0.42		0.59	0.03		0.04	0.09	
Uniform Delay, d1	35.5	4.7		43.5	9.7		38.8	36.7		36.7	36.9	
Progression Factor	1.02	0.81		0.73	0.61		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.2	0.7		2.4	0.6		7.5	0.1		0.1	0.3	
Delay (s)	45.2	4.5		34.1	6.5		46.3	36.7		36.8	37.1	
Level of Service	D	A		C	A		D	D		D	D	
Approach Delay (s)		10.2			6.7			45.1			37.1	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3341		1770	3533		1770	1596		1770	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.67	1.00		0.66	1.00	
Satd. Flow (perm)	1770	3341		1770	3533		1252	1596		1230	1597	
Volume (vph)	215	362	216	62	397	5	161	5	99	5	5	94
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	226	381	227	65	418	5	169	5	104	5	5	99
RTOR Reduction (vph)	0	67	0	0	1	0	0	84	0	0	80	0
Lane Group Flow (vph)	226	541	0	65	422	0	169	25	0	5	24	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	18.6	52.6		7.5	41.5		17.3	17.3		17.3	17.3	
Effective Green, g (s)	18.8	52.8		7.7	41.7		17.5	17.5		17.5	17.5	
Actuated g/C Ratio	0.21	0.59		0.09	0.46		0.19	0.19		0.19	0.19	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	370	1960		151	1637		243	310		239	311	
v/s Ratio Prot	c0.13	c0.16		c0.04	0.12			0.02			0.02	
v/s Ratio Perm							c0.13			0.00		
v/c Ratio	0.61	0.28		0.43	0.26		0.70	0.08		0.02	0.08	
Uniform Delay, d1	32.3	9.2		39.1	14.7		33.8	29.7		29.3	29.7	
Progression Factor	0.84	0.72		0.99	1.26		1.08	1.87		1.00	1.00	
Incremental Delay, d2	2.6	0.3		1.8	0.4		6.6	0.1		0.0	0.1	
Delay (s)	29.6	6.9		40.4	18.9		43.2	55.7		29.4	29.8	
Level of Service	C	A		D	B		D	E		C	C	
Approach Delay (s)		13.0			21.8			48.1			29.7	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM Average Control Delay	22.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.85	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3407		1770	1505	1504	1770	1594	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.69	1.00	1.00	0.14	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3407		1287	1505	1504	262	1594	
Volume (vph)	223	365	87	105	318	105	140	3	1309	142	4	93
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	235	384	92	111	335	111	147	3	1378	149	4	98
RTOR Reduction (vph)	0	0	77	0	34	0	0	217	217	0	51	0
Lane Group Flow (vph)	235	384	15	111	412	0	147	475	472	149	51	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	13.0	14.9	14.9	19.3	21.2		43.2	43.2	43.2	43.2	43.2	
Effective Green, g (s)	13.2	15.1	15.1	19.5	21.4		43.4	43.4	43.4	43.4	43.4	
Actuated g/C Ratio	0.15	0.17	0.17	0.22	0.24		0.48	0.48	0.48	0.48	0.48	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	260	594	266	744	810		621	726	725	126	769	
v/s Ratio Prot	c0.13	0.11		0.03	c0.12			0.32			0.03	
v/s Ratio Perm			0.01				0.11		0.31	c0.57		
v/c Ratio	0.90	0.65	0.06	0.15	0.51		0.24	0.65	0.65	1.18	0.07	
Uniform Delay, d1	37.8	35.0	31.5	28.5	29.7		13.6	17.6	17.6	23.3	12.5	
Progression Factor	0.93	0.92	0.79	0.95	0.95		0.64	0.60	0.60	1.00	1.00	
Incremental Delay, d2	31.4	2.4	0.1	0.4	2.2		0.2	1.8	1.8	137.5	0.0	
Delay (s)	66.5	34.4	24.8	27.5	30.4		8.9	12.4	12.3	160.8	12.5	
Level of Service	E	C	C	C	C		A	B	B	F	B	
Approach Delay (s)		43.8			29.9			12.0			100.5	
Approach LOS		D			C			B			F	

Intersection Summary			
HCM Average Control Delay	30.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3534		1770	1509	1504	1770	1661	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.75	1.00	1.00	0.36	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3534		1389	1509	1504	665	1661	
Volume (vph)	20	1734	61	415	447	5	69	5	550	7	5	12
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	1825	64	437	471	5	73	5	579	7	5	13
RTOR Reduction (vph)	0	0	12	0	1	0	0	224	224	0	11	0
Lane Group Flow (vph)	21	1825	52	437	475	0	73	70	66	7	7	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	2.5	52.0	52.0	14.4	63.9		11.0	11.0	11.0	11.0	11.0	
Effective Green, g (s)	2.7	52.2	52.2	14.6	64.1		11.2	11.2	11.2	11.2	11.2	
Actuated g/C Ratio	0.03	0.58	0.58	0.16	0.71		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	53	2053	918	557	2517		173	188	187	83	207	
v/s Ratio Prot	0.01	c0.52		c0.13	0.13			0.05			0.00	
v/s Ratio Perm			0.03				c0.05		0.04	0.01		
v/c Ratio	0.40	0.89	0.06	0.78	0.19		0.42	0.37	0.35	0.08	0.03	
Uniform Delay, d1	42.8	16.4	8.2	36.2	4.3		36.4	36.2	36.1	34.9	34.6	
Progression Factor	1.07	0.76	0.51	1.00	1.00		0.98	0.89	0.89	1.00	1.00	
Incremental Delay, d2	3.2	3.5	0.0	10.6	0.2		1.7	1.2	1.1	0.4	0.1	
Delay (s)	49.1	15.9	4.2	46.8	4.5		37.2	33.6	33.2	35.3	34.7	
Level of Service	D	B	A	D	A		D	C	C	D	C	
Approach Delay (s)		15.9			24.7			33.8			34.9	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2269	21	0	866	0	402
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	2388	22	0	912	0	423
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.48		0.48	0.48
vC, conflicting volume			2411		2844	1194
vC1, stage 1 conf vol					2388	
vC2, stage 2 conf vol					456	
vCu, unblocked vol			2851		3750	329
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	51
cM capacity (veh/h)			63		14	863

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	1194	1194	22	456	456	423
Volume Left	0	0	0	0	0	0
Volume Right	0	0	22	0	0	423
cSH	1700	1700	1700	1700	1700	863
Volume to Capacity	0.70	0.70	0.01	0.27	0.27	0.49
Queue Length 95th (ft)	0	0	0	0	0	69
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	13.1
Lane LOS						B
Approach Delay (s)	0.0			0.0		13.1
Approach LOS						B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1628		1770	1608		1770	3505		1770	3536	
Flt Permitted	0.72	1.00		0.74	1.00		0.65	1.00		0.14	1.00	
Satd. Flow (perm)	1342	1628		1373	1608		1202	3505		257	3536	
Volume (vph)	2	5	25	64	5	48	64	1403	98	34	160	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	5	26	67	5	51	67	1477	103	36	168	1
RTOR Reduction (vph)	0	24	0	0	43	0	0	3	0	0	0	0
Lane Group Flow (vph)	2	7	0	67	13	0	67	1577	0	36	169	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.3	8.3		8.3	8.3		73.3	73.3		73.3	73.3	
Effective Green, g (s)	8.5	8.5		8.5	8.5		73.5	73.5		73.5	73.5	
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.82	0.82		0.82	0.82	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	154		130	152		982	2862		210	2888	
v/s Ratio Prot		0.00			0.01			c0.45			0.05	
v/s Ratio Perm	0.00			c0.05			0.06			0.14		
v/c Ratio	0.02	0.05		0.52	0.09		0.07	0.55		0.17	0.06	
Uniform Delay, d1	37.0	37.1		38.8	37.2		1.6	2.8		1.8	1.6	
Progression Factor	1.00	1.00		1.00	1.00		0.39	0.44		1.16	0.56	
Incremental Delay, d2	0.0	0.1		3.4	0.3		0.1	0.6		1.7	0.0	
Delay (s)	37.0	37.2		42.2	37.5		0.7	1.8		3.8	0.9	
Level of Service	D	D		D	D		A	A		A	A	
Approach Delay (s)		37.2			40.1			1.7			1.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	28	11	5	5	61	168
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	29	12	5	5	64	177
RTOR Reduction (vph)	0	2	0	0	0	32
Lane Group Flow (vph)	29	10	5	5	64	145
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	2.7	76.3	1.1	8.0	73.6	73.6
Effective Green, g (s)	2.9	76.7	1.3	8.2	73.8	73.8
Actuated g/C Ratio	0.03	0.85	0.01	0.09	0.82	0.82
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	114	1419	50	322	1451	1298
v/s Ratio Prot	c0.01	0.01	c0.00	0.00	0.04	
v/s Ratio Perm		0.00				c0.09
v/c Ratio	0.25	0.01	0.10	0.02	0.04	0.11
Uniform Delay, d1	42.5	1.0	43.8	37.2	1.5	1.6
Progression Factor	1.00	1.00	0.84	0.86	0.92	3.64
Incremental Delay, d2	1.2	0.0	0.9	0.0	0.1	0.2
Delay (s)	43.7	1.0	37.4	31.9	1.4	6.0
Level of Service	D	A	D	C	A	A
Approach Delay (s)	31.2			34.7	4.8	
Approach LOS	C			C	A	

Intersection Summary			
HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.90		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1683		1770	1858		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1683		1770	1858		1770	1863	1583
Volume (vph)	170	17	8	2	5	9	5	419	7	7	147	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	18	8	2	5	9	5	441	7	7	155	5
RTOR Reduction (vph)	0	0	5	0	7	0	0	1	0	0	0	3
Lane Group Flow (vph)	179	18	3	2	7	0	5	447	0	7	155	2
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	14.1	34.8	34.8	3.2	23.9		1.3	33.8		1.4	33.9	33.9
Effective Green, g (s)	14.3	35.0	35.0	3.4	24.1		1.5	34.0		1.6	34.1	34.1
Actuated g/C Ratio	0.16	0.39	0.39	0.04	0.27		0.02	0.38		0.02	0.38	0.38
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	281	725	616	67	451		30	702		31	706	600
v/s Ratio Prot	c0.10	c0.01		c0.00	0.00		0.00	c0.24		0.00	c0.08	
v/s Ratio Perm			0.00									0.00
v/c Ratio	0.64	0.02	0.01	0.03	0.02		0.17	0.64		0.23	0.22	0.00
Uniform Delay, d1	35.4	17.0	16.8	41.7	24.2		43.6	22.9		43.6	18.9	17.4
Progression Factor	0.80	0.64	0.49	0.93	0.97		1.38	0.61		0.91	0.85	0.66
Incremental Delay, d2	4.7	0.1	0.0	0.2	0.1		1.5	1.1		3.6	0.2	0.0
Delay (s)	33.1	10.9	8.3	39.1	23.6		61.7	15.2		43.2	16.3	11.6
Level of Service	C	B	A	D	C		E	B		D	B	B
Approach Delay (s)		30.2			25.5			15.7			17.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	19.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1653		1770	3520		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1653		1770	3520		1770	3539	1583
Volume (vph)	14	6	12	29	1	3	8	1789	67	2	395	2
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	6	13	31	1	3	8	1883	71	2	416	2
RTOR Reduction (vph)	0	0	12	0	3	0	0	2	0	0	0	1
Lane Group Flow (vph)	15	6	1	31	1	0	8	1952	0	2	416	1
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	0.8	3.7	3.7	2.7	5.6		1.4	65.6		1.2	65.4	65.4
Effective Green, g (s)	1.0	3.9	3.9	2.9	5.8		1.6	65.8		1.4	65.6	65.6
Actuated g/C Ratio	0.01	0.04	0.04	0.03	0.06		0.02	0.73		0.02	0.73	0.73
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	20	81	69	57	107		31	2574		28	2580	1154
v/s Ratio Prot	0.01	c0.00		c0.02	0.00		c0.00	c0.55		0.00	0.12	
v/s Ratio Perm			0.00									0.00
v/c Ratio	0.75	0.07	0.01	0.54	0.01		0.26	0.76		0.07	0.16	0.00
Uniform Delay, d1	44.4	41.3	41.2	42.9	39.4		43.6	7.3		43.7	3.7	3.3
Progression Factor	0.98	0.55	0.45	1.00	0.98		1.11	0.64		0.92	1.14	1.14
Incremental Delay, d2	90.7	0.4	0.0	10.2	0.0		3.7	1.8		1.1	0.1	0.0
Delay (s)	134.0	23.3	18.4	52.9	38.7		52.1	6.5		41.1	4.4	3.8
Level of Service	F	C	B	D	D		D	A		D	A	A
Approach Delay (s)		70.3			51.3			6.7			4.6	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	21	2	52	31	2	119	31	9	7	4	1	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	2	55	33	2	125	33	9	7	4	1	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	127			57			147	266	29	188	231	65
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	127			57			147	266	29	188	231	65
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			98			96	98	99	99	100	99
cM capacity (veh/h)	1459			1548			794	616	1045	737	645	999

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	22	57	33	127	49	11
Volume Left	22	0	33	0	33	4
Volume Right	0	55	0	125	7	5
cSH	1459	1700	1548	1700	779	834
Volume to Capacity	0.02	0.03	0.02	0.07	0.06	0.01
Queue Length 95th (ft)	1	0	2	0	5	1
Control Delay (s)	7.5	0.0	7.4	0.0	9.9	9.4
Lane LOS	A		A		A	A
Approach Delay (s)	2.1		1.5		9.9	9.4
Approach LOS					A	A

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	25.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	7	4	5	243	18	5	168	1413	43	5	1207	43
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	7	4	5	256	19	5	177	1487	45	5	1271	45
RTOR Reduction (vph)	0	0	5	0	0	4	0	0	17	0	0	20
Lane Group Flow (vph)	7	4	0	256	19	1	177	1487	28	5	1271	25
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	0.8	1.3	1.3	18.7	19.2	19.2	9.7	52.4	52.4	0.8	43.5	43.5
Effective Green, g (s)	1.0	1.5	1.5	18.9	19.4	19.4	9.9	52.6	52.6	1.0	43.7	43.7
Actuated g/C Ratio	0.01	0.02	0.02	0.21	0.22	0.22	0.11	0.58	0.58	0.01	0.49	0.49
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	20	31	26	372	402	341	378	2068	925	20	1718	769
v/s Ratio Prot	c0.00	0.00		c0.14	0.01		0.05	c0.42		0.00	c0.36	
v/s Ratio Perm			0.00			0.00			0.02			0.02
v/c Ratio	0.35	0.13	0.00	0.69	0.05	0.00	0.47	0.72	0.03	0.25	0.74	0.03
Uniform Delay, d1	44.2	43.6	43.5	32.8	28.0	27.7	37.6	13.4	7.9	44.1	18.6	12.1
Progression Factor	0.97	0.97	1.02	1.00	1.00	1.00	1.00	1.00	1.00	0.69	0.64	0.28
Incremental Delay, d2	10.3	1.9	0.0	5.2	0.0	0.0	0.9	2.2	0.1	5.7	2.5	0.1
Delay (s)	53.0	44.0	44.3	38.1	28.0	27.7	38.5	15.6	8.0	36.2	14.5	3.4
Level of Service	D	D	D	D	C	C	D	B	A	D	B	A
Approach Delay (s)		48.0			37.2			17.8			14.2	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	18.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5068		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	5068		3433	5085	1583	1405	1863	1583	1388	1863	1583
Volume (vph)	447	951	22	61	944	38	128	18	400	12	5	179
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	471	1001	23	64	994	40	135	19	421	13	5	188
RTOR Reduction (vph)	0	3	0	0	0	26	0	0	152	0	0	149
Lane Group Flow (vph)	471	1021	0	64	994	14	135	19	269	13	5	39
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	26.5	40.8		18.1	32.4	32.4	18.5	18.5	18.5	18.5	18.5	18.5
Effective Green, g (s)	26.7	41.0		18.3	32.6	32.6	18.7	18.7	18.7	18.7	18.7	18.7
Actuated g/C Ratio	0.30	0.46		0.20	0.36	0.36	0.21	0.21	0.21	0.21	0.21	0.21
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	525	2309		698	1842	573	292	387	329	288	387	329
v/s Ratio Prot	c0.27	0.20		0.02	c0.20			0.01			0.00	
v/s Ratio Perm						0.01	0.10		c0.17	0.01		0.02
v/c Ratio	0.90	0.44		0.09	0.54	0.03	0.46	0.05	0.82	0.05	0.01	0.12
Uniform Delay, d1	30.3	16.7		29.1	22.8	18.5	31.2	28.5	34.0	28.5	28.3	29.0
Progression Factor	0.79	0.72		0.90	0.91	0.98	1.00	1.00	1.00	1.14	1.12	2.85
Incremental Delay, d2	14.5	0.5		0.1	1.1	0.1	1.2	0.1	14.5	0.1	0.0	0.2
Delay (s)	38.4	12.5		26.2	21.8	18.2	32.4	28.6	48.5	32.7	31.6	82.7
Level of Service	D	B		C	C	B	C	C	D	C	C	F
Approach Delay (s)		20.7			21.9			44.1			78.3	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5065		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5065		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	880	1062	29	199	618	224	20	260	969	53	24	358
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	926	1118	31	209	651	236	21	274	1020	56	25	377
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	49	0	0	123
Lane Group Flow (vph)	926	1146	0	209	651	236	21	274	971	56	25	254
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	27.7	27.9		22.7	22.9	90.0	2.0	18.4	41.1	4.2	20.6	48.3
Effective Green, g (s)	27.9	28.1		22.9	23.1	90.0	2.2	18.6	41.5	4.4	20.8	48.7
Actuated g/C Ratio	0.31	0.31		0.25	0.26	1.00	0.02	0.21	0.46	0.05	0.23	0.54
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1064	1581		874	1305	1583	43	385	1285	87	431	1632
v/s Ratio Prot	c0.27	0.23		0.06	0.13		0.01	0.15	c0.19	c0.03	0.01	0.05
v/s Ratio Perm						c0.15			0.16			0.04
v/c Ratio	0.87	0.72		0.24	0.50	0.15	0.49	0.71	0.76	0.64	0.06	0.16
Uniform Delay, d1	29.3	27.5		26.6	28.5	0.0	43.3	33.2	20.1	42.0	27.0	10.3
Progression Factor	0.86	0.85		0.80	0.84	1.00	1.00	1.00	1.00	1.01	1.13	0.71
Incremental Delay, d2	7.5	2.8		0.1	1.3	0.2	8.5	6.1	2.6	15.1	0.1	0.0
Delay (s)	32.8	26.0		21.6	25.2	0.2	51.8	39.3	22.6	57.5	30.5	7.4
Level of Service	C	C		C	C	A	D	D	C	E	C	A
Approach Delay (s)		29.1			19.1			26.6			14.8	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5081		1770	5037		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.75	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	1770	5081		1770	5037		1405	1863	1583	1330	1863	1583
Volume (vph)	94	2124	12	69	823	55	44	63	688	15	5	19
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	99	2236	13	73	866	58	46	66	724	16	5	20
RTOR Reduction (vph)	0	1	0	0	8	0	0	0	72	0	0	12
Lane Group Flow (vph)	99	2248	0	73	916	0	46	66	653	16	5	8
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	7.9	37.7		4.9	34.7		34.8	34.8	34.8	34.8	34.8	34.8
Effective Green, g (s)	8.1	37.9		5.1	34.9		35.0	35.0	35.0	35.0	35.0	35.0
Actuated g/C Ratio	0.09	0.42		0.06	0.39		0.39	0.39	0.39	0.39	0.39	0.39
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	159	2140		100	1953		546	725	616	517	725	616
v/s Ratio Prot	0.06	c0.44		c0.04	0.18			0.04			0.00	
v/s Ratio Perm							0.03		c0.41	0.01		0.00
v/c Ratio	0.62	1.05		0.73	0.47		0.08	0.09	1.06	0.03	0.01	0.01
Uniform Delay, d1	39.5	26.0		41.8	20.6		17.4	17.4	27.5	17.0	16.9	16.9
Progression Factor	0.88	0.91		1.00	1.00		1.00	1.00	1.00	0.99	1.00	0.98
Incremental Delay, d2	5.5	32.0		23.7	0.8		0.1	0.1	53.0	0.0	0.0	0.0
Delay (s)	40.2	55.8		65.5	21.4		17.4	17.5	80.5	16.9	16.9	16.6
Level of Service	D	E		E	C		B	B	F	B	B	B
Approach Delay (s)		55.1			24.7			72.0			16.7	
Approach LOS		E			C			E			B	

Intersection Summary			
HCM Average Control Delay	50.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Appendix F – Project Land Use Data, Trip Rates, and Vehicle Miles Traveled Estimates

Appendix F - 2017 River Islands Development Land Use Assumptions

Phase	TJKM Traffic Zone	Neighborhood	Land Use Data				
			# of Homes		Employees		
			SF	MF	Retail	Service	Other
Phase I	790	East Village	725	0	0	0	0
Phase I	791	East Village	106	23	0	0	0
Phase I	792	East Village	283	45	0	0	0
Phase I	794	East Village	116	0	0	0	0
Phase I	795	East Village	142	13	0	0	0
Phase I	817	East Village	142	0	0	0	0
Phase I	819	East Village	0	18	0	0	0
Phase I	820	East Village	0	32	0	0	0
Phase I	821	East Village	0	18	0	0	0
Phase I	822	East Village	0	31	0	0	0
Phase I	829	East Village	103	0	0	0	0
Phase I	830	East Village	129	0	0	0	0
Phase I	831	East Village	129	13	0	0	0
Phase I	832	East Village	103	10	0	0	0
Phase I	836	East Village	126	0	0	0	0
Phase I	801	Employment Center	0	0	296	530	340
Phase I	802	Employment Center	0	0	0	492	934
Phase I	803	Employment Center	0	0	0	606	1309
Phase I	804	Employment Center	0	0	296	403	340
Phase I	846	Employment Center	0	0	0	484	1047
Phase I	847	Employment Center	0	0	0	161	349
Phase I	848	Employment Center	0	0	0	281	534
Phase I	849	Employment Center	0	0	0	422	801
Phase I	815	Lakeside	685	0	0	0	0
Phase I	816	Lakeside	315	0	0	0	0
Phase I	837	Town Center	0	0	67	67	0
Phase I	788	Town Center	82	0	0	0	0
Phase I	799	Town Center	85	0	0	0	0
Phase I	828	Town Center	15	0	0	0	0
Phase I	785	Town Center	34	0	0	0	0
Phase I	786	Town Center	54	41	96	0	0
Phase I	787	Town Center	0	0	0	0	0
Phase I	789	Town Center	35	0	0	0	0
Phase I	793	Town Center	43	0	142	70	0
Phase I	796	Town Center	101	0	106	40	0
Phase I	798	Town Center	112	0	0	0	0
Phase I	818	Town Center	0	113	107	0	0

Phase 1	823	Town Center	0	48	75	40	144
Phase 1	824	Town Center	0	0	141	218	0
Phase 1	825	Town Center	4	0	0	0	0
Phase 1	826	Town Center	6	0	0	0	0
Phase 1	827	Town Center	33	0	0	0	0
Phase 1	833	Town Center	33	0	48	0	34
Phase 1	834	Town Center	0	88	0	0	0
Phase 1	835	Town Center	0	53	0	0	0
Totals			**3,739**	**547**	**1,374**	**3,813**	**5,832**
Phase 2	805	Employment Center	0	0	21	35	24
Phase 2	806	Employment Center	0	0	0	83	127
Phase 2	845	Employment Center	0	0	0	0	0
Phase 2	800	Lake Harbor	21	14	0	0	0
Phase 2	844	Old River Road	49	14	0	0	0
Phase 2	807	West Village	25	8	0	0	0
Phase 2	808	West Village	14	21	0	2	2
Phase 2	809	West Village	26	16	0	1	0
Phase 2	810	West Village	18	25	0	0	0
Phase 2	811	West Village	8	7	0	0	0
Phase 2	812	West Village	3	17	9	1	1
Phase 2	813	Woodlands	52	61	0	0	0
Phase 2	814	Woodlands	55	16	0	0	0
Totals			**271**	**199**	**30**	**123**	**155**

Appendix F - 2031 River Islands Development Land Use Assumptions

Phase	TJKM Traffic Zone	Neighborhood	Land Use Data				
			# of Homes		Employees		
			SF	MF	Retail	Service	Other
Phase I	790	East Village	725	0	0	0	0
Phase I	791	East Village	106	23	0	0	0
Phase I	792	East Village	283	45	0	0	0
Phase I	794	East Village	116	0	0	0	0
Phase I	795	East Village	142	13	0	0	0
Phase I	817	East Village	142	0	0	0	0
Phase I	819	East Village	0	18	0	0	0
Phase I	820	East Village	0	32	0	0	0
Phase I	821	East Village	0	18	0	0	0
Phase I	822	East Village	0	31	0	0	0
Phase I	829	East Village	103	0	0	0	0
Phase I	830	East Village	129	0	0	0	0
Phase I	831	East Village	129	13	0	0	0
Phase I	832	East Village	103	10	0	0	0
Phase I	836	East Village	126	0	0	0	0
Phase I	801	Employment Center	0	0	296	530	340
Phase I	802	Employment Center	0	0	0	492	934
Phase I	803	Employment Center	0	0	0	606	1309
Phase I	804	Employment Center	0	0	296	403	340
Phase I	846	Employment Center	0	0	0	484	1047
Phase I	847	Employment Center	0	0	0	161	349
Phase I	848	Employment Center	0	0	0	281	534
Phase I	849	Employment Center	0	0	0	422	801
Phase I	815	Lakeside	685	0	0	0	0
Phase I	816	Lakeside	315	0	0	0	0
Phase I	837	Town Center	0	0	67	67	0
Phase I	788	Town Center	82	0	0	0	0
Phase I	799	Town Center	85	0	0	0	0
Phase I	828	Town Center	15	0	0	0	0
Phase I	785	Town Center	34	0	0	0	0
Phase I	786	Town Center	54	41	96	0	0
Phase I	787	Town Center	0	0	0	0	0
Phase I	789	Town Center	35	0	0	0	0
Phase I	793	Town Center	43	0	142	70	0
Phase I	796	Town Center	101	0	106	40	0
Phase I	798	Town Center	112	0	0	0	0
Phase I	818	Town Center	0	113	107	0	0

Phase 1	823	Town Center	0	48	75	40	144
Phase 1	824	Town Center	0	0	141	218	0
Phase 1	825	Town Center	4	0	0	0	0
Phase 1	826	Town Center	6	0	0	0	0
Phase 1	827	Town Center	33	0	0	0	0
Phase 1	833	Town Center	33	0	48	0	34
Phase 1	834	Town Center	0	88	0	0	0
Phase 1	835	Town Center	0	53	0	0	0
Totals			**3,739**	**547**	**1,374**	**3,813**	**5,832**
Phase 2	805	Employment Center	0	0	296	494	340
Phase 2	806	Employment Center	0	0	0	1191	1814
Phase 2	845	Employment Center	0	0	0	0	0
Phase 2	800	Lake Harbor	300	200	0	0	0
Phase 2	844	Old River Road	700	200	0	0	0
Phase 2	807	West Village	351	120	0	0	0
Phase 2	808	West Village	198	300	0	34	34
Phase 2	809	West Village	378	230	0	13	0
Phase 2	810	West Village	264	360	0	3	0
Phase 2	811	West Village	119	100	0	0	0
Phase 2	812	West Village	41	240	126	21	21
Phase 2	813	Woodlands	737	870	0	0	0
Phase 2	814	Woodlands	784	229	0	0	0
Totals			**3,871**	**2,849**	**422**	**1,756**	**2,209**

Appendix F: River Islands Development Trip Rates and VMT - 2017 Baseline Conditions

Trip Rates and VMT

Land Use	Trip Rates			VMT		
	Daily	AM	PM	Daily	AM	PM
Residential	10.34	0.55	0.23	702,176	47,614	14,218
Service/Office	8.02	0.06	1.06	651,827	3,625	97,648
Retail	16.94	0.17	0.75	328,885	3,289	14,471
Other	4.53	0.09	0.09	266,459	5,063	5,063
School	1.60	0.48	0.14	54,043	16,213	4,864

Trip by Purpose

Purpose	Daily		AM		PM	
	VMT	%	VMT	%	VMT	%
Home Based Work	390,134	20.2%	36,291	39.9%	97,930	51.0%
Home Based Other	325,149	30.0%	11,426	22.4%	23,111	21.4%
Home Based School	272,607	24.6%	9,130	17.4%	19,879	18.0%
Other Based Work	65,679	8.4%	2,496	6.8%	2,496	3.2%
Other Based Other	134,930	16.8%	5,127	13.5%	5,127	6.4%

Appendix F: River Islands Development Trip Rates and VMT - 2017 Plus Project Conditions

Trip Rates and VMT

Land Use	Trip Rates			VMT		
	Daily	AM	PM	Daily	AM	PM
Residential	10.30	0.55	0.23	776,855	53,102	15,681
Service/Office	8.13	0.06	1.07	680,628	3,799	101,826
Retail	17.61	0.18	0.77	348,911	3,489	15,352
Other	4.59	0.09	0.09	276,878	5,261	5,261
School	1.60	0.48	0.14	53,990	16,197	4,859

Trip by Purpose

Purpose	Daily		AM		PM	
	VMT	%	VMT	%	VMT	%
Home Based Work	414,455	20.2%	40,503	40.8%	102,223	50.5%
Home Based Other	349,130	30.3%	12,398	22.3%	24,671	21.7%
Home Based School	293,578	24.8%	9,922	17.4%	21,308	18.3%
Other Based Work	69,606	8.4%	2,645	6.6%	2,645	3.2%
Other Based Other	140,209	16.4%	5,328	12.9%	5,328	6.3%

Appendix F: River Islands Development Trip Rates and VMT - 2031 Baseline Conditions

Trip Rates and VMT

Land Use	Trip Rates			VMT		
	Daily	AM	PM	Daily	AM	PM
Residential	10.18	0.54	0.22	723,678	49,431	14,611
Service/Office	7.78	0.06	1.03	674,866	3,719	101,429
Retail	16.91	0.17	0.74	341,301	3,413	15,017
Other	4.51	0.09	0.09	267,990	5,092	5,092
School	1.60	0.48	0.14	54,361	16,308	4,892

Trip by Purpose

Purpose	Daily		AM		PM	
	VMT	%	VMT	%	VMT	%
Home Based Work	405,816	19.8%	37,847	39.3%	101,776	50.2%
Home Based Other	334,766	30.1%	11,731	22.5%	23,831	21.7%
Home Based School	282,007	24.7%	9,426	17.6%	20,585	18.3%
Other Based Work	65,969	8.4%	2,507	6.8%	2,507	3.2%
Other Based Other	135,299	16.9%	5,141	13.7%	5,141	6.5%

Appendix F: River Islands Development Trip Rates and VMT - 2031 Plus Project Conditions

Trip Rates and VMT

Land Use	Trip Rates			VMT		
	Daily	AM	PM	Daily	AM	PM
Residential	9.91	0.56	0.21	1,845,093	135,726	36,124
Service/Office	8.95	0.07	1.15	1,112,418	6,348	165,073
Retail	24.52	0.25	1.08	646,942	6,469	28,465
Other	5.11	0.10	0.10	418,388	7,949	7,949
School	1.60	0.48	0.14	54,361	16,308	4,892

Trip by Purpose

Purpose	Daily		AM		PM	
	VMT	%	VMT	%	VMT	%
Home Based Work	787,141	19.8%	105,739	47.1%	167,376	46.3%
Home Based Other	675,319	31.3%	25,457	21.0%	46,072	23.5%
Home Based School	600,335	27.1%	21,420	17.2%	42,309	21.0%
Other Based Work	124,301	8.2%	4,723	5.5%	4,723	3.4%
Other Based Other	211,235	13.6%	8,027	9.2%	8,027	5.7%

Appendix G – Level of Service Worksheets: Year 2017 With Action

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	244	785	40	1589	1314	378	54	260	689	562	888	967
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	257	826	42	1673	1383	398	57	274	725	592	935	1018
RTOR Reduction (vph)	0	0	21	0	0	275	0	0	4	0	0	247
Lane Group Flow (vph)	257	826	21	1673	1383	123	57	274	721	592	935	771
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.3	21.1	21.1	32.9	35.7	35.7	4.3	28.6	61.5	18.4	42.7	42.7
Effective Green, g (s)	18.5	22.4	22.4	33.1	37.0	37.0	4.5	29.9	63.0	18.6	44.0	44.0
Actuated g/C Ratio	0.15	0.19	0.19	0.28	0.31	0.31	0.04	0.25	0.52	0.16	0.37	0.37
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	529	949	295	1376	1568	488	66	1267	1463	773	1865	580
v/s Ratio Prot	0.07	0.16		c0.34	c0.27		0.03	0.05	0.14	c0.12	0.18	
v/s Ratio Perm			0.01			0.08			0.12			c0.49
v/c Ratio	0.49	0.87	0.07	1.22	0.88	0.25	0.86	0.22	0.49	0.77	0.50	1.33
Uniform Delay, d1	46.4	47.4	40.2	43.4	39.4	31.1	57.4	35.8	18.3	48.6	29.5	38.0
Progression Factor	0.86	1.05	1.14	0.93	0.90	0.62	1.24	0.65	1.01	1.00	1.00	1.00
Incremental Delay, d2	0.7	10.2	0.4	97.8	0.8	0.1	61.3	0.1	0.2	4.6	0.2	159.8
Delay (s)	40.6	60.1	46.3	138.0	36.1	19.3	132.6	23.4	18.7	53.2	29.7	197.8
Level of Service	D	E	D	F	D	B	F	C	B	D	C	F
Approach Delay (s)		55.1			83.5			26.1			102.4	
Approach LOS		E			F			C			F	

Intersection Summary			
HCM Average Control Delay	78.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.97	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4696	1375		4456	1263				3155		2561
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4696	1375		4456	1263				3155		2561
Volume (vph)	0	912	1132	0	1834	425	0	0	0	272	0	1814
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	960	1192	0	1931	447	0	0	0	286	0	1909
RTOR Reduction (vph)	0	38	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1187	927	0	1931	447	0	0	0	286	0	1909
Heavy Vehicles (%)	1%	1%	1%	10%	10%	10%	2%	2%	2%	11%	11%	11%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		42.7	120.0		42.7	120.0				67.4		67.4
Effective Green, g (s)		44.0	120.0		44.0	120.0				68.0		68.0
Actuated g/C Ratio		0.37	1.00		0.37	1.00				0.57		0.57
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		1722	1375		1634	1263				1788		1451
v/s Ratio Prot		0.25			c0.43							
v/s Ratio Perm			0.67			0.35				0.09		c0.75
v/c Ratio		0.69	0.67		1.18	0.35				0.16		1.32
Uniform Delay, d1		32.2	0.0		38.0	0.0				12.4		26.0
Progression Factor		0.59	1.00		0.65	1.00				1.00		1.00
Incremental Delay, d2		1.6	1.8		86.2	0.5				0.0		146.9
Delay (s)		20.6	1.8		111.0	0.5				12.4		172.9
Level of Service		C	A		F	A				B		F
Approach Delay (s)		12.5			90.2			0.0			152.0	
Approach LOS		B			F			A			F	

Intersection Summary			
HCM Average Control Delay	85.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	108.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3273	3374			4456	1263	1466	1471	2429			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3273	3374			4456	1263	1466	1471	2429			
Volume (vph)	291	893	0	0	1962	522	297	5	445	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	306	940	0	0	2065	549	313	5	468	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	198	0	0	310	0	0	0
Lane Group Flow (vph)	306	940	0	0	2065	351	157	161	158	0	0	0
Heavy Vehicles (%)	7%	7%	7%	10%	10%	10%	17%	17%	17%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	15.3	92.1			73.3	73.3	18.0	18.0	18.0			
Effective Green, g (s)	15.5	93.4			73.9	73.9	18.6	18.6	18.6			
Actuated g/C Ratio	0.13	0.78			0.62	0.62	0.16	0.16	0.16			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	423	2626			2744	778	227	228	376			
v/s Ratio Prot	c0.09	0.28			c0.46		0.11	c0.11				
v/s Ratio Perm						0.28			0.06			
v/c Ratio	0.72	0.36			0.75	0.45	0.69	0.71	0.42			
Uniform Delay, d1	50.2	4.1			16.5	12.3	48.0	48.1	45.8			
Progression Factor	0.65	0.73			0.25	0.97	1.00	1.00	1.00			
Incremental Delay, d2	5.0	0.3			0.2	0.2	8.8	9.6	0.8			
Delay (s)	37.7	3.3			4.3	12.1	56.8	57.7	46.6			
Level of Service	D	A			A	B	E	E	D			
Approach Delay (s)		11.7			5.9			50.9			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1626	4673	1455	1671	4748		2993	1564		1480	2906	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1626	4673	1455	1671	4748		2993	1564		1480	2906	
Volume (vph)	154	794	265	120	1902	158	526	289	95	189	405	55
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	162	836	279	126	2002	166	554	304	100	199	426	58
RTOR Reduction (vph)	0	0	167	0	8	0	0	10	0	0	9	0
Lane Group Flow (vph)	162	836	112	126	2160	0	554	394	0	199	475	0
Heavy Vehicles (%)	11%	11%	11%	8%	8%	8%	17%	17%	17%	22%	22%	22%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	10.8	47.6	47.6	13.6	50.4		21.9	25.7		14.8	19.3	
Effective Green, g (s)	11.0	48.2	48.2	13.8	51.0		22.1	27.0		15.0	19.9	
Actuated g/C Ratio	0.09	0.40	0.40	0.12	0.42		0.18	0.22		0.12	0.17	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	149	1877	584	192	2018		551	352		185	482	
v/s Ratio Prot	c0.10	0.18		0.08	c0.45		0.19	c0.25		0.13	c0.16	
v/s Ratio Perm			0.08									
v/c Ratio	1.09	0.45	0.19	0.66	1.07		1.01	1.12		1.08	0.99	
Uniform Delay, d1	54.5	26.2	23.3	50.8	34.5		48.9	46.5		52.5	49.9	
Progression Factor	0.95	0.84	1.63	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	95.2	0.7	0.7	7.8	41.9		39.7	84.2		87.7	36.8	
Delay (s)	147.0	22.6	38.6	58.7	76.4		88.6	130.7		140.2	86.7	
Level of Service	F	C	D	E	E		F	F		F	F	
Approach Delay (s)		41.9			75.4			106.4			102.3	
Approach LOS		D			E			F			F	

Intersection Summary			
HCM Average Control Delay	76.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	209	73	35	3	37	72	62	609	14	30	1780	256
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	220	77	37	3	39	76	65	641	15	32	1874	269
RTOR Reduction (vph)	0	0	29	0	0	69	0	0	8	0	0	85
Lane Group Flow (vph)	220	77	8	3	39	7	65	641	7	32	1874	184
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	15.0	23.2	23.2	0.9	9.1	9.1	10.7	54.8	54.8	22.1	66.2	66.2
Effective Green, g (s)	15.2	24.5	24.5	1.1	10.4	10.4	10.9	56.1	56.1	22.3	67.5	67.5
Actuated g/C Ratio	0.13	0.20	0.20	0.01	0.09	0.09	0.09	0.47	0.47	0.19	0.56	0.56
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	224	380	323	16	161	242	161	1654	740	329	1991	890
v/s Ratio Prot	c0.12	c0.04		0.00	0.02		0.04	c0.18		0.02	c0.53	
v/s Ratio Perm			0.00			0.00			0.00			0.12
v/c Ratio	0.98	0.20	0.02	0.19	0.24	0.03	0.40	0.39	0.01	0.10	0.94	0.21
Uniform Delay, d1	52.3	39.6	38.2	59.0	51.1	50.2	51.5	20.8	17.1	40.5	24.4	13.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.96	0.81	0.59	0.36	0.05
Incremental Delay, d2	54.8	0.3	0.0	5.6	0.8	0.0	1.6	0.7	0.0	0.0	4.2	0.2
Delay (s)	107.0	39.9	38.2	64.6	51.9	50.2	47.2	20.7	13.8	23.8	12.8	0.8
Level of Service	F	D	D	E	D	D	D	C	B	C	B	A
Approach Delay (s)		83.9			51.1			23.0			11.5	
Approach LOS		F			D			C			B	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.75	1.00	1.00	0.74	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1393	1863	1583	1373	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	70	29	135	22	14	155	15	460	15	32	1765	22
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	31	142	23	15	163	16	484	16	34	1858	23
RTOR Reduction (vph)	0	0	102	0	0	146	0	0	4	0	0	5
Lane Group Flow (vph)	74	31	40	23	15	17	16	484	12	34	1858	18
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	11.5	11.5	11.5	11.5	11.5	11.5	3.1	88.3	88.3	5.4	90.6	90.6
Effective Green, g (s)	12.8	12.8	12.8	12.8	12.8	12.8	3.3	89.6	89.6	5.6	91.9	91.9
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11	0.11	0.03	0.75	0.75	0.05	0.77	0.77
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	149	199	169	146	199	169	49	2642	1182	83	2710	1212
v/s Ratio Prot		0.02			0.01		0.01	0.14		c0.02	c0.52	
v/s Ratio Perm	c0.05		0.03	0.02		0.01			0.01			0.01
v/c Ratio	0.50	0.16	0.24	0.16	0.08	0.10	0.33	0.18	0.01	0.41	0.69	0.01
Uniform Delay, d1	50.6	48.7	49.1	48.7	48.3	48.4	57.3	4.5	3.9	55.6	6.9	3.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.37	0.13	0.00
Incremental Delay, d2	2.6	0.4	0.7	0.5	0.2	0.3	3.9	0.2	0.0	1.5	0.6	0.0
Delay (s)	53.2	49.1	49.9	49.2	48.4	48.7	61.1	4.6	3.9	77.6	1.5	0.0
Level of Service	D	D	D	D	D	D	E	A	A	E	A	A
Approach Delay (s)		50.7			48.7			6.3			2.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.75	1.00	1.00	0.76	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1394	1863	1583	1407	1863	1583
Volume (vph)	20	599	40	94	2192	48	52	4	218	156	13	116
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	631	42	99	2307	51	55	4	229	164	14	122
RTOR Reduction (vph)	0	0	14	0	0	12	0	0	195	0	0	58
Lane Group Flow (vph)	21	631	28	99	2307	39	55	4	34	164	14	64
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	1.7	77.6	77.6	11.1	87.0	87.0	16.5	16.5	16.5	16.5	16.5	16.5
Effective Green, g (s)	1.9	78.9	78.9	11.3	88.3	88.3	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.02	0.66	0.66	0.09	0.74	0.74	0.15	0.15	0.15	0.15	0.15	0.15
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	28	2327	1041	167	2604	1165	207	276	235	209	276	235
v/s Ratio Prot	0.01	0.18		c0.06	c0.65			0.00			0.01	
v/s Ratio Perm			0.02			0.02	0.04		0.02	c0.12		0.04
v/c Ratio	0.75	0.27	0.03	0.59	0.89	0.03	0.27	0.01	0.14	0.78	0.05	0.27
Uniform Delay, d1	58.8	8.6	7.2	52.1	12.0	4.3	45.3	43.6	44.5	49.3	43.9	45.4
Progression Factor	1.00	1.00	1.00	1.17	0.71	0.19	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	71.5	0.3	0.0	0.5	0.5	0.0	0.7	0.0	0.3	17.4	0.1	0.6
Delay (s)	130.3	8.9	7.2	61.3	9.0	0.8	46.0	43.6	44.8	66.6	43.9	46.0
Level of Service	F	A	A	E	A	A	D	D	D	E	D	D
Approach Delay (s)		12.4			11.0			45.0			57.2	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0	4.0	4.0
Lane Util. Factor			1.00	0.95	0.95	1.00
Frt			1.00	1.00	1.00	0.85
Flt Protected			0.95	1.00	1.00	1.00
Satd. Flow (prot)			1770	3539	3539	1583
Flt Permitted			0.07	1.00	1.00	1.00
Satd. Flow (perm)			124	3539	3539	1583
Volume (vph)	0	0	14	592	2355	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	15	623	2479	5
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	15	623	2479	5
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)			60.0	60.0	60.0	60.0
Effective Green, g (s)			60.0	60.0	60.0	60.0
Actuated g/C Ratio			1.00	1.00	1.00	1.00
Clearance Time (s)			4.5	4.5	4.5	4.5
Vehicle Extension (s)			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)			124	3539	3539	1583
v/s Ratio Prot				0.18	c0.70	
v/s Ratio Perm			0.12			0.00
v/c Ratio			0.12	0.18	0.70	0.00
Uniform Delay, d1			0.0	0.0	0.0	0.0
Progression Factor			1.00	1.00	1.00	1.00
Incremental Delay, d2			2.0	0.1	0.6	0.0
Delay (s)			2.0	0.1	0.6	0.0
Level of Service			A	A	A	A
Approach Delay (s)	0.0			0.2	0.6	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	0.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.91						1.00	0.85	1.00	1.00	
Flt Protected		0.98						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1372						2888	1292	1583	1667	
Flt Permitted		0.98						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1372						2888	1292	1583	1667	
Volume (vph)	78	3	162	0	0	0	0	412	249	20	277	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	82	3	171	0	0	0	0	434	262	21	292	0
RTOR Reduction (vph)	0	136	0	0	0	0	0	0	129	0	0	0
Lane Group Flow (vph)	0	120	0	0	0	0	0	434	133	21	292	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	25%	25%	25%	14%	14%	14%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		8.5						22.0	22.0	0.8	27.0	
Effective Green, g (s)		9.1						22.9	22.9	1.0	27.9	
Actuated g/C Ratio		0.20						0.51	0.51	0.02	0.62	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		277						1470	657	35	1034	
v/s Ratio Prot		c0.09						0.15		0.01	c0.18	
v/s Ratio Perm									0.10			
v/c Ratio		0.43						0.30	0.20	0.60	0.28	
Uniform Delay, d1		15.7						6.4	6.1	21.8	3.9	
Progression Factor		1.00						1.00	1.00	1.18	0.62	
Incremental Delay, d2		1.1						0.5	0.7	13.3	0.3	
Delay (s)		16.8						6.9	6.7	39.0	2.8	
Level of Service		B						A	A	D	A	
Approach Delay (s)		16.8			0.0			6.8			5.2	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	106.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.96		1.00	1.00			0.87	
Flt Protected					0.97		0.95	1.00			1.00	
Satd. Flow (prot)					1533		1388	2777			1397	
Flt Permitted					0.97		0.95	1.00			1.00	
Satd. Flow (perm)					1533		1388	2777			1397	
Volume (vph)	0	0	0	233	5	101	155	335	0	0	64	813
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	245	5	106	163	353	0	0	67	856
RTOR Reduction (vph)	0	0	0	0	17	0	0	0	0	0	426	0
Lane Group Flow (vph)	0	0	0	0	339	0	163	353	0	0	497	0
Heavy Vehicles (%)	2%	2%	2%	15%	15%	15%	30%	30%	30%	19%	19%	19%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					22.8		13.7	57.7			39.8	
Effective Green, g (s)					23.4		13.9	58.6			40.7	
Actuated g/C Ratio					0.26		0.15	0.65			0.45	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					399		214	1808			632	
v/s Ratio Prot					c0.22		c0.12	0.13			c0.36	
v/s Ratio Perm												
v/c Ratio					0.85		0.76	0.20			0.79	
Uniform Delay, d1					31.6		36.5	6.3			21.0	
Progression Factor					1.00		0.92	0.78			1.00	
Incremental Delay, d2					15.4		14.3	0.2			9.5	
Delay (s)					47.1		47.9	5.1			30.5	
Level of Service					D		D	A			C	
Approach Delay (s)		0.0			47.1			18.6			30.5	
Approach LOS		A			D			B			C	

Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	106.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		1.00						1.00	0.85	1.00	1.00	
Flt Protected		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770						1863	1583	1770	1863	
Flt Permitted		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770						1863	1583	1770	1863	
Volume (vph)	720	0	17	0	0	0	0	61	87	34	1229	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	758	0	18	0	0	0	0	64	92	36	1294	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	45	0	0	0
Lane Group Flow (vph)	0	775	0	0	0	0	0	64	47	36	1294	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		46.4						65.5	65.5	4.0	73.7	
Effective Green, g (s)		47.0						66.8	66.8	4.2	75.0	
Actuated g/C Ratio		0.36						0.51	0.51	0.03	0.58	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		640						957	813	57	1075	
v/s Ratio Prot		c0.44						0.03		0.02	c0.69	
v/s Ratio Perm									0.03			
v/c Ratio		1.21						0.07	0.06	0.63	1.20	
Uniform Delay, d1		41.5						15.9	15.8	62.1	27.5	
Progression Factor		1.00						1.00	1.00	1.31	0.28	
Incremental Delay, d2		109.2						0.1	0.1	2.1	92.6	
Delay (s)		150.7						16.0	16.0	83.6	100.4	
Level of Service		F						B	B	F	F	
Approach Delay (s)		150.7			0.0			16.0			99.9	
Approach LOS		F			A			B			F	

Intersection Summary			
HCM Average Control Delay	111.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00		1.00	1.00		1.00	0.88		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1656	3310		1770	3537		1671	2958		1543	2818	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1656	3310		1770	3537		1671	2958		1543	2818	
Volume (vph)	51	248	1	737	741	3	219	238	786	9	539	737
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	54	261	1	776	780	3	231	251	827	9	567	776
RTOR Reduction (vph)	0	0	0	0	0	0	0	445	0	0	157	0
Lane Group Flow (vph)	54	262	0	776	783	0	231	633	0	9	1186	0
Heavy Vehicles (%)	9%	9%	9%	2%	2%	2%	8%	8%	8%	17%	17%	17%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	7.5	15.1		42.6	50.2		16.2	52.5		0.8	37.1	
Effective Green, g (s)	7.7	16.4		42.8	51.5		16.4	53.8		1.0	38.4	
Actuated g/C Ratio	0.06	0.13		0.33	0.40		0.13	0.41		0.01	0.30	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	98	418		583	1401		211	1224		12	832	
v/s Ratio Prot	0.03	c0.08		c0.44	0.22		c0.14	0.21		0.01	c0.42	
v/s Ratio Perm												
v/c Ratio	0.55	0.63		1.33	0.56		1.09	0.52		0.75	1.29dr	
Uniform Delay, d1	59.5	53.9		43.6	30.4		56.8	28.4		64.4	45.8	
Progression Factor	1.00	1.00		1.00	1.00		0.81	0.48		1.00	1.00	
Incremental Delay, d2	6.6	2.9		160.5	0.5		71.2	0.8		128.3	198.4	
Delay (s)	66.0	56.8		204.1	30.9		117.0	14.4		192.6	244.2	
Level of Service	E	E		F	C		F	B		F	F	
Approach Delay (s)		58.4			117.1			32.5			243.8	
Approach LOS		E			F			C			F	

Intersection Summary			
HCM Average Control Delay	126.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	111.8%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.91		1.00	1.00			1.00	0.85
Flt Protected					0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1662		1770	1863			1863	1583
Flt Permitted					0.99		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1662		1770	1863			1863	1583
Volume (vph)	0	0	0	200	0	462	10	771	0	0	1063	214
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	211	0	486	11	812	0	0	1119	225
RTOR Reduction (vph)	0	0	0	0	60	0	0	0	0	0	0	64
Lane Group Flow (vph)	0	0	0	0	637	0	11	812	0	0	1119	161
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					47.5		1.7	72.6			66.7	66.7
Effective Green, g (s)					48.1		1.9	73.9			68.0	68.0
Actuated g/C Ratio					0.37		0.01	0.57			0.52	0.52
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					615		26	1059			974	828
v/s Ratio Prot					c0.38		0.01	c0.44			c0.60	
v/s Ratio Perm												0.10
v/c Ratio					1.04		0.42	0.77			1.15	0.19
Uniform Delay, d1					41.0		63.5	21.5			31.0	16.5
Progression Factor					1.00		1.26	1.48			0.57	0.21
Incremental Delay, d2					45.9		1.0	0.5			68.3	0.0
Delay (s)					86.9		81.2	32.3			85.9	3.5
Level of Service					F		F	C			F	A
Approach Delay (s)		0.0			86.9			33.0			72.1	
Approach LOS		A			F			C			E	

Intersection Summary			
HCM Average Control Delay	64.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3518	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3518	
Volume (vph)	14	48	36	455	35	18	24	95	141	40	719	29
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	51	38	479	37	19	25	100	148	42	757	31
RTOR Reduction (vph)	0	0	34	0	0	14	0	0	93	0	3	0
Lane Group Flow (vph)	15	51	4	479	37	5	25	100	55	42	785	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	0.8	8.9	8.9	14.8	22.9	22.9	1.9	29.7	29.7	9.8	37.6	
Effective Green, g (s)	1.0	9.1	9.1	15.0	23.1	23.1	2.1	29.9	29.9	10.0	37.8	
Actuated g/C Ratio	0.01	0.11	0.11	0.19	0.29	0.29	0.03	0.37	0.37	0.12	0.47	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	22	212	180	644	538	457	46	696	592	221	1662	
v/s Ratio Prot	0.01	c0.03		c0.14	0.02		c0.01	0.05		0.02	c0.22	
v/s Ratio Perm			0.00			0.00			0.03			
v/c Ratio	0.68	0.24	0.02	0.74	0.07	0.01	0.54	0.14	0.09	0.19	0.47	
Uniform Delay, d1	39.3	32.3	31.5	30.7	20.6	20.3	38.5	16.6	16.3	31.4	14.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.42	
Incremental Delay, d2	62.1	0.6	0.1	4.6	0.1	0.0	12.5	0.4	0.3	0.4	0.8	
Delay (s)	101.5	32.9	31.6	35.3	20.7	20.3	50.9	17.0	16.6	22.9	6.9	
Level of Service	F	C	C	D	C	C	D	B	B	C	A	
Approach Delay (s)		42.3			33.8			19.9			7.7	
Approach LOS		D			C			B			A	

Intersection Summary			
HCM Average Control Delay	19.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	47.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	27	60	729	50	37	89
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	28	63	767	53	39	94
RTOR Reduction (vph)	0	58	0	0	0	21
Lane Group Flow (vph)	28	5	767	53	39	73
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	5.7	5.7	58.6	68.5	3.1	61.7
Effective Green, g (s)	5.9	5.9	58.8	68.7	3.3	62.1
Actuated g/C Ratio	0.07	0.07	0.74	0.86	0.04	0.78
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	137	117	1301	1600	73	1308
v/s Ratio Prot	c0.02		c0.43	0.03	c0.02	0.04
v/s Ratio Perm		0.00				0.01
v/c Ratio	0.20	0.04	0.59	0.03	0.53	0.06
Uniform Delay, d1	34.8	34.4	5.0	0.8	37.6	2.1
Progression Factor	1.00	1.00	0.61	0.19	1.34	0.49
Incremental Delay, d2	0.7	0.1	1.9	0.0	7.3	0.0
Delay (s)	35.6	34.6	4.9	0.2	57.7	1.0
Level of Service	D	C	A	A	E	A
Approach Delay (s)	34.9			4.6	17.7	
Approach LOS	C			A	B	

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	37	78	592	62	206	186
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	39	82	623	65	217	196
RTOR Reduction (vph)	0	0	0	24	0	160
Lane Group Flow (vph)	39	82	623	41	217	36
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	3.1	57.1	49.8	49.8	14.5	14.5
Effective Green, g (s)	3.3	57.3	50.0	50.0	14.7	14.7
Actuated g/C Ratio	0.04	0.72	0.62	0.62	0.18	0.18
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	73	2535	2212	989	325	291
v/s Ratio Prot	c0.02	0.02	c0.18		c0.12	
v/s Ratio Perm				0.03		0.02
v/c Ratio	0.53	0.03	0.28	0.04	0.67	0.12
Uniform Delay, d1	37.6	3.3	6.8	5.8	30.4	27.3
Progression Factor	0.72	1.29	0.25	0.15	1.00	1.00
Incremental Delay, d2	7.3	0.0	0.3	0.1	5.1	0.2
Delay (s)	34.2	4.3	2.0	0.9	35.5	27.5
Level of Service	C	A	A	A	D	C
Approach Delay (s)		13.9	1.9		31.7	
Approach LOS		B	A		C	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	12	402	1061	39	133	66
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	423	1117	41	140	69
RTOR Reduction (vph)	0	0	0	12	0	60
Lane Group Flow (vph)	13	423	1117	29	140	9
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	1.5	61.8	56.1	56.1	9.8	9.8
Effective Green, g (s)	1.7	62.0	56.3	56.3	10.0	10.0
Actuated g/C Ratio	0.02	0.78	0.70	0.70	0.12	0.12
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	38	2743	2491	1114	221	198
v/s Ratio Prot	c0.01	0.12	c0.32			
v/s Ratio Perm				0.02	c0.08	0.01
v/c Ratio	0.34	0.15	0.45	0.03	0.63	0.04
Uniform Delay, d1	38.6	2.3	5.1	3.6	33.3	30.8
Progression Factor	1.46	0.32	0.24	0.20	1.00	1.00
Incremental Delay, d2	5.1	0.1	0.5	0.0	5.8	0.1
Delay (s)	61.3	0.9	1.8	0.7	39.1	30.9
Level of Service	E	A	A	A	D	C
Approach Delay (s)		2.7	1.7		36.4	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.92		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3469		1770	3537		1770	1723		1770	1591	
Flt Permitted	0.95	1.00		0.95	1.00		0.48	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3469		1770	3537		895	1723		1399	1591	
Volume (vph)	45	465	70	5	981	5	119	5	5	5	5	172
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	489	74	5	1033	5	125	5	5	5	5	181
RTOR Reduction (vph)	0	10	0	0	0	0	0	4	0	0	149	0
Lane Group Flow (vph)	47	553	0	5	1038	0	125	6	0	5	37	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	6.6	52.0		1.3	46.7		14.1	14.1		14.1	14.1	
Effective Green, g (s)	6.8	52.2		1.5	46.9		14.3	14.3		14.3	14.3	
Actuated g/C Ratio	0.08	0.65		0.02	0.59		0.18	0.18		0.18	0.18	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	150	2264		33	2074		160	308		250	284	
v/s Ratio Prot	0.03	c0.16		0.00	c0.29			0.00			0.02	
v/s Ratio Perm							c0.14			0.00		
v/c Ratio	0.31	0.24		0.15	0.50		0.78	0.02		0.02	0.13	
Uniform Delay, d1	34.4	5.7		38.6	9.7		31.4	27.1		27.1	27.6	
Progression Factor	1.00	1.03		0.96	0.80		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.3		2.1	0.8		21.5	0.0		0.0	0.2	
Delay (s)	35.5	6.2		39.3	8.6		52.9	27.1		27.1	27.8	
Level of Service	D	A		D	A		D	C		C	C	
Approach Delay (s)		8.4			8.8			50.9			27.8	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3446		1770	3530		1770	1593		1770	1591	
Flt Permitted	0.95	1.00		0.95	1.00		0.53	1.00		0.74	1.00	
Satd. Flow (perm)	1770	3446		1770	3530		990	1593		1375	1591	
Volume (vph)	47	271	58	83	268	5	196	1	27	5	5	173
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	49	285	61	87	282	5	206	1	28	5	5	182
RTOR Reduction (vph)	0	16	0	0	1	0	0	22	0	0	140	0
Lane Group Flow (vph)	49	330	0	87	286	0	206	7	0	5	47	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	5.3	39.4		9.7	43.8		18.3	18.3		18.3	18.3	
Effective Green, g (s)	5.5	39.6		9.9	44.0		18.5	18.5		18.5	18.5	
Actuated g/C Ratio	0.07	0.50		0.12	0.55		0.23	0.23		0.23	0.23	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	122	1706		219	1942		229	368		318	368	
v/s Ratio Prot	c0.03	c0.10		c0.05	0.08			0.00			0.03	
v/s Ratio Perm							c0.21			0.00		
v/c Ratio	0.40	0.19		0.40	0.15		0.90	0.02		0.02	0.13	
Uniform Delay, d1	35.7	11.3		32.3	8.8		29.8	23.8		23.7	24.4	
Progression Factor	0.72	0.95		1.09	1.02		0.92	0.87		1.00	1.00	
Incremental Delay, d2	2.1	0.2		1.1	0.2		33.4	0.0		0.0	0.2	
Delay (s)	27.9	11.0		36.4	9.2		60.8	20.8		23.7	24.5	
Level of Service	C	B		D	A		E	C		C	C	
Approach Delay (s)		13.1			15.5			55.9			24.5	
Approach LOS		B			B			E			C	

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.85	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3420		1770	1512	1504	1770	1585	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.41	1.00	1.00	0.73	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3420		760	1512	1504	1367	1585	
Volume (vph)	45	186	113	1217	299	86	51	1	64	43	1	174
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	196	119	1281	315	91	54	1	67	45	1	183
RTOR Reduction (vph)	0	0	102	0	25	0	0	29	30	0	161	0
Lane Group Flow (vph)	47	196	17	1281	381	0	54	5	4	45	23	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	5.4	11.3	11.3	46.5	52.4		9.6	9.6	9.6	9.6	9.6	
Effective Green, g (s)	5.6	11.5	11.5	46.7	52.6		9.8	9.8	9.8	9.8	9.8	
Actuated g/C Ratio	0.07	0.14	0.14	0.58	0.66		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	124	509	228	2004	2249		93	185	184	167	194	
v/s Ratio Prot	0.03	c0.06		c0.37	0.11			0.00			0.01	
v/s Ratio Perm			0.01				c0.07		0.00	0.03		
v/c Ratio	0.38	0.39	0.08	0.64	0.17		0.58	0.03	0.02	0.27	0.12	
Uniform Delay, d1	35.5	31.0	29.6	11.1	5.3		33.2	30.9	30.9	31.9	31.3	
Progression Factor	0.55	1.28	2.95	0.74	1.23		0.97	1.46	1.51	1.00	1.00	
Incremental Delay, d2	1.9	0.5	0.1	1.3	0.1		8.9	0.1	0.0	0.9	0.3	
Delay (s)	21.3	40.1	87.5	9.5	6.6		41.0	45.2	46.7	32.7	31.5	
Level of Service	C	D	F	A	A		D	D	D	C	C	
Approach Delay (s)		53.3			8.8			43.8			31.8	
Approach LOS		D			A			D			C	

Intersection Summary			
HCM Average Control Delay	19.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3538		1770	1515	1504	1770	1633	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.74	1.00	1.00	0.55	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3538		1377	1515	1504	1025	1633	
Volume (vph)	6	281	6	856	1536	4	43	5	220	2	5	22
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	6	296	6	901	1617	4	45	5	232	2	5	23
RTOR Reduction (vph)	0	0	5	0	0	0	0	104	104	0	21	0
Lane Group Flow (vph)	6	296	1	901	1621	0	45	17	12	2	7	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	0.8	17.9	17.9	41.7	58.8		7.8	7.8	7.8	7.8	7.8	
Effective Green, g (s)	1.0	18.1	18.1	41.9	59.0		8.0	8.0	8.0	8.0	8.0	
Actuated g/C Ratio	0.01	0.23	0.23	0.52	0.74		0.10	0.10	0.10	0.10	0.10	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	22	801	358	1798	2609		138	152	150	103	163	
v/s Ratio Prot	0.00	c0.08		0.26	c0.46			0.01			0.00	
v/s Ratio Perm			0.00				c0.03		0.01	0.00		
v/c Ratio	0.27	0.37	0.00	0.50	0.62		0.33	0.11	0.08	0.02	0.04	
Uniform Delay, d1	39.1	26.1	24.0	12.3	5.1		33.5	32.8	32.7	32.5	32.5	
Progression Factor	0.52	0.28	0.25	1.00	1.00		1.01	1.04	1.05	1.00	1.00	
Incremental Delay, d2	6.3	0.3	0.0	1.0	1.1		1.4	0.3	0.2	0.1	0.1	
Delay (s)	26.5	7.6	5.9	13.3	6.2		35.3	34.5	34.6	32.5	32.7	
Level of Service	C	A	A	B	A		D	C	C	C	C	
Approach Delay (s)		7.9			8.7			34.6			32.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	485	17	0	2396	0	63
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	511	18	0	2522	0	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.97		0.97	0.97
vC, conflicting volume			528		1772	255
vC1, stage 1 conf vol					511	
vC2, stage 2 conf vol					1261	
vCu, unblocked vol			483		1765	202
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	96
cM capacity (veh/h)			1044		176	1678

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	255	255	18	1261	1261	66
Volume Left	0	0	0	0	0	0
Volume Right	0	0	18	0	0	66
cSH	1700	1700	1700	1700	1700	1678
Volume to Capacity	0.15	0.15	0.01	0.74	0.74	0.04
Queue Length 95th (ft)	0	0	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	7.2
Lane LOS						A
Approach Delay (s)	0.0			0.0		7.2
Approach LOS						A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.87		1.00	0.93		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1612		1770	1626		1770	3294		1770	3539	
Flt Permitted	0.74	1.00		0.73	1.00		0.17	1.00		0.64	1.00	
Satd. Flow (perm)	1370	1612		1352	1626		320	3294		1197	3539	
Volume (vph)	1	5	41	109	5	27	38	88	76	33	1297	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1	5	43	115	5	28	40	93	80	35	1365	1
RTOR Reduction (vph)	0	37	0	0	24	0	0	18	0	0	0	0
Lane Group Flow (vph)	1	11	0	115	9	0	40	155	0	35	1366	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.2	10.2		10.2	10.2		61.4	61.4		61.4	61.4	
Effective Green, g (s)	10.4	10.4		10.4	10.4		61.6	61.6		61.6	61.6	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.77	0.77		0.77	0.77	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	178	210		176	211		246	2536		922	2725	
v/s Ratio Prot		0.01			0.01			0.05			c0.39	
v/s Ratio Perm	0.00			c0.09			0.12			0.03		
v/c Ratio	0.01	0.05		0.65	0.04		0.16	0.06		0.04	0.50	
Uniform Delay, d1	30.3	30.5		33.1	30.4		2.4	2.2		2.2	3.4	
Progression Factor	1.00	1.00		1.00	1.00		3.38	3.23		0.03	0.10	
Incremental Delay, d2	0.0	0.1		8.4	0.1		1.4	0.0		0.1	0.5	
Delay (s)	30.3	30.6		41.5	30.5		9.6	7.2		0.1	0.9	
Level of Service	C	C		D	C		A	A		A	A	
Approach Delay (s)		30.6			39.1			7.7			0.9	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	5.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰↰	↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	8	197	129	23	65	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	207	136	24	68	1
RTOR Reduction (vph)	0	53	0	0	0	0
Lane Group Flow (vph)	8	154	136	24	68	1
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	1.2	59.0	8.4	13.8	57.8	57.8
Effective Green, g (s)	1.4	59.4	8.6	14.0	58.0	58.0
Actuated g/C Ratio	0.02	0.74	0.11	0.18	0.72	0.72
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	62	1255	369	619	1283	1148
v/s Ratio Prot	0.00	c0.09	c0.04	0.01	0.04	
v/s Ratio Perm		0.01				0.00
v/c Ratio	0.13	0.12	0.37	0.04	0.05	0.00
Uniform Delay, d1	38.7	2.9	33.2	27.4	3.1	3.0
Progression Factor	1.00	1.00	0.98	0.98	1.00	1.00
Incremental Delay, d2	0.9	0.0	0.6	0.0	0.1	0.0
Delay (s)	39.6	3.0	33.0	27.0	3.2	3.0
Level of Service	D	A	C	C	A	A
Approach Delay (s)	4.3			32.1	3.2	
Approach LOS	A			C	A	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1838		1770	1859		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1838		1770	1859		1770	1863	1583
Volume (vph)	2	12	8	6	20	2	5	75	1	5	341	124
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	13	8	6	21	2	5	79	1	5	359	131
RTOR Reduction (vph)	0	0	4	0	1	0	0	1	0	0	0	91
Lane Group Flow (vph)	2	13	4	6	22	0	5	79	0	5	359	40
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	1.2	37.8	37.8	1.6	38.2		1.3	22.5		1.3	22.5	22.5
Effective Green, g (s)	1.4	38.0	38.0	1.8	38.4		1.5	22.7		1.5	22.7	22.7
Actuated g/C Ratio	0.02	0.48	0.48	0.02	0.48		0.02	0.28		0.02	0.28	0.28
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	31	885	752	40	882		33	527		33	529	449
v/s Ratio Prot	c0.00	0.01		c0.00	c0.01		0.00	c0.04		0.00	c0.19	
v/s Ratio Perm			0.00									0.03
v/c Ratio	0.06	0.01	0.01	0.15	0.02		0.15	0.15		0.15	0.68	0.09
Uniform Delay, d1	38.7	11.1	11.1	38.3	10.9		38.6	21.4		38.6	25.4	21.1
Progression Factor	1.07	1.23	1.39	0.90	0.77		0.52	0.08		1.10	0.79	0.49
Incremental Delay, d2	0.9	0.0	0.0	1.7	0.1		2.0	0.1		2.1	3.4	0.1
Delay (s)	42.1	13.7	15.4	36.2	8.5		22.2	1.8		44.8	23.5	10.5
Level of Service	D	B	B	D	A		C	A		D	C	B
Approach Delay (s)		16.8			14.2			3.0			20.3	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1793		1770	3520		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1793		1770	3520		1770	3539	1583
Volume (vph)	6	1	5	96	3	1	4	351	13	2	1679	20
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	6	1	5	101	3	1	4	369	14	2	1767	21
RTOR Reduction (vph)	0	0	5	0	1	0	0	2	0	0	0	2
Lane Group Flow (vph)	6	1	0	101	3	0	4	381	0	2	1767	19
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	1.3	1.6	1.6	5.4	5.7		1.3	55.0		1.2	54.9	54.9
Effective Green, g (s)	1.5	1.8	1.8	5.6	5.9		1.5	55.2		1.4	55.1	55.1
Actuated g/C Ratio	0.02	0.02	0.02	0.07	0.07		0.02	0.69		0.02	0.69	0.69
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	33	42	36	124	132		33	2429		31	2437	1090
v/s Ratio Prot	c0.00	0.00		c0.06	0.00		c0.00	0.11		0.00	c0.50	
v/s Ratio Perm			0.00									0.01
v/c Ratio	0.18	0.02	0.00	0.81	0.02		0.12	0.16		0.06	0.73	0.02
Uniform Delay, d1	38.6	38.2	38.2	36.7	34.4		38.6	4.3		38.7	7.7	3.9
Progression Factor	0.82	0.74	0.62	1.00	1.01		1.07	0.04		1.07	0.37	0.40
Incremental Delay, d2	2.6	0.2	0.0	32.1	0.1		1.5	0.1		0.8	1.8	0.0
Delay (s)	34.3	28.4	23.5	68.8	34.7		42.8	0.3		42.2	4.7	1.6
Level of Service	C	C	C	E	C		D	A		D	A	A
Approach Delay (s)		29.3			67.5			0.7			4.7	
Approach LOS		C			E			A			A	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	1	15	3	1	11	55	5	7	67	6	45
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	1	16	3	1	12	58	5	7	71	6	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	13			17			77	38	9	35	41	7
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	13			17			77	38	9	35	41	7
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			93	99	99	93	99	96
cM capacity (veh/h)	1606			1600			863	849	1073	957	847	1076

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	17	3	13	71	124
Volume Left	5	0	3	0	58	71
Volume Right	0	16	0	12	7	47
cSH	1606	1700	1600	1700	880	992
Volume to Capacity	0.00	0.01	0.00	0.01	0.08	0.13
Queue Length 95th (ft)	0	0	0	0	7	11
Control Delay (s)	7.2	0.0	7.3	0.0	9.4	9.1
Lane LOS	A		A		A	A
Approach Delay (s)	1.7		1.5		9.4	9.1
Approach LOS					A	A

Intersection Summary			
Average Delay	8.0		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583		3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583		3539	1583
Volume (vph)	132	43	125	46	9	5	12	896	122	0	1395	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	139	45	132	48	9	5	13	943	128	0	1468	53
RTOR Reduction (vph)	0	0	118	0	0	5	0	0	40	0	0	17
Lane Group Flow (vph)	139	45	14	48	9	0	13	943	88	0	1468	36
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	10.7	8.3	8.3	4.6	2.2	2.2	6.7	55.2	55.2		44.3	44.3
Effective Green, g (s)	10.9	8.5	8.5	4.8	2.4	2.4	6.9	55.4	55.4		44.5	44.5
Actuated g/C Ratio	0.14	0.11	0.11	0.06	0.03	0.03	0.09	0.69	0.69		0.55	0.55
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2		4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	239	196	167	105	55	47	294	2429	1087		1951	873
v/s Ratio Prot	c0.08	0.02		c0.03	0.00		0.00	c0.27			c0.41	
v/s Ratio Perm			0.01			0.00			0.06			0.02
v/c Ratio	0.58	0.23	0.08	0.46	0.16	0.00	0.04	0.39	0.08		0.75	0.04
Uniform Delay, d1	32.8	33.1	32.6	36.7	38.2	38.0	33.9	5.4	4.2		13.9	8.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.6	0.6	0.2	3.1	1.4	0.0	0.1	0.1	0.0		1.7	0.0
Delay (s)	36.3	33.7	32.8	39.8	39.6	38.0	33.9	5.5	4.2		15.6	8.3
Level of Service	D	C	C	D	D	D	C	A	A		B	A
Approach Delay (s)		34.5			39.6			5.7			15.3	
Approach LOS		C			D			A			B	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	80.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4964		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.74	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	4964		3433	5085	1583	1386	1863	1583	1405	1863	1583
Volume (vph)	89	798	151	429	1101	4	12	5	31	19	19	373
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	94	840	159	452	1159	4	13	5	33	20	20	393
RTOR Reduction (vph)	0	26	0	0	0	2	0	0	27	0	0	286
Lane Group Flow (vph)	94	973	0	452	1159	2	13	5	6	20	20	107
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	9.6	37.7		16.3	44.4	44.4	13.4	13.4	13.4	13.4	13.4	13.4
Effective Green, g (s)	9.8	37.9		16.5	44.6	44.6	13.6	13.6	13.6	13.6	13.6	13.6
Actuated g/C Ratio	0.12	0.47		0.21	0.56	0.56	0.17	0.17	0.17	0.17	0.17	0.17
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	217	2352		708	2835	883	236	317	269	239	317	269
v/s Ratio Prot	0.05	c0.20		c0.13	c0.23			0.00			0.01	
v/s Ratio Perm						0.00	0.01		0.00	0.01		c0.07
v/c Ratio	0.43	0.41		0.64	0.41	0.00	0.06	0.02	0.02	0.08	0.06	0.40
Uniform Delay, d1	32.5	13.8		29.0	10.1	7.8	27.8	27.6	27.7	28.0	27.9	29.6
Progression Factor	1.00	1.00		0.80	0.79	0.58	1.00	1.00	1.00	0.50	0.50	1.37
Incremental Delay, d2	1.4	0.5		1.4	0.3	0.0	0.1	0.0	0.0	0.1	0.1	0.8
Delay (s)	33.9	14.3		24.8	8.3	4.5	27.9	27.7	27.7	14.1	14.1	41.3
Level of Service	C	B		C	A	A	C	C	C	B	B	D
Approach Delay (s)		16.0			12.9			27.7			38.8	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5049		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5049		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	333	394	20	984	1192	26	29	9	61	112	268	900
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	351	415	21	1036	1255	27	31	9	64	118	282	947
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	40	0	0	86
Lane Group Flow (vph)	351	429	0	1036	1255	27	31	9	24	118	282	861
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	15.3	16.2		28.4	29.3	80.0	1.6	1.4	29.8	17.2	17.0	32.3
Effective Green, g (s)	15.5	16.4		28.6	29.5	80.0	1.8	1.6	30.2	17.4	17.2	32.7
Actuated g/C Ratio	0.19	0.20		0.36	0.37	1.00	0.02	0.02	0.38	0.22	0.22	0.41
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	665	1035		1227	1875	1583	40	37	1052	385	401	1139
v/s Ratio Prot	0.10	0.08		c0.30	0.25		c0.02	0.00	0.01	0.07	0.15	c0.15
v/s Ratio Perm						c0.02			0.00			0.16
v/c Ratio	0.53	0.41		0.84	0.67	0.02	0.78	0.24	0.02	0.31	0.70	0.76
Uniform Delay, d1	29.0	27.6		23.7	21.2	0.0	38.9	38.6	15.6	26.2	29.0	20.2
Progression Factor	0.53	0.49		0.84	0.79	1.00	1.00	1.00	1.00	0.68	0.74	0.61
Incremental Delay, d2	0.7	1.1		4.5	1.6	0.0	61.5	3.4	0.0	0.3	4.2	2.2
Delay (s)	16.0	14.8		24.4	18.4	0.0	100.4	42.0	15.6	18.1	25.8	14.5
Level of Service	B	B		C	B	A	F	D	B	B	C	B
Approach Delay (s)		15.3			20.9			43.2			17.2	
Approach LOS		B			C			D			B	

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5013		1770	5080		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.72	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	5013		1770	5080		1346	1863	1583	1405	1863	1583
Volume (vph)	8	383	40	720	2340	17	13	5	77	12	50	56
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	403	42	758	2463	18	14	5	81	13	53	59
RTOR Reduction (vph)	0	17	0	0	0	0	0	0	74	0	0	54
Lane Group Flow (vph)	8	428	0	758	2481	0	14	5	7	13	53	5
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	0.8	12.7		48.4	60.3		6.3	6.3	6.3	6.3	6.3	6.3
Effective Green, g (s)	1.0	12.9		48.6	60.5		6.5	6.5	6.5	6.5	6.5	6.5
Actuated g/C Ratio	0.01	0.16		0.61	0.76		0.08	0.08	0.08	0.08	0.08	0.08
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	22	808		1075	3842		109	151	129	114	151	129
v/s Ratio Prot	0.00	c0.09		c0.43	c0.49			0.00			c0.03	
v/s Ratio Perm							0.01		0.00	0.01		0.00
v/c Ratio	0.36	0.53		0.71	0.65		0.13	0.03	0.05	0.11	0.35	0.04
Uniform Delay, d1	39.2	30.8		10.8	4.6		34.1	33.9	33.9	34.1	34.8	33.9
Progression Factor	0.62	0.57		1.00	1.00		1.00	1.00	1.00	1.01	1.00	1.00
Incremental Delay, d2	9.6	2.4		2.1	0.8		0.5	0.1	0.2	0.4	1.4	0.1
Delay (s)	33.8	19.9		12.9	5.5		34.7	33.9	34.1	34.7	36.2	33.9
Level of Service	C	B		B	A		C	C	C	C	D	C
Approach Delay (s)		20.1			7.2			34.1			35.0	
Approach LOS		C			A			C			D	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	946	1831	58	821	1037	565	43	1657	1883	394	350	319
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	996	1927	61	864	1092	595	45	1744	1982	415	368	336
RTOR Reduction (vph)	0	0	11	0	0	92	0	0	0	0	0	235
Lane Group Flow (vph)	996	1927	50	864	1092	503	45	1744	1982	415	368	101
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	34.8	42.9	42.9	36.8	44.9	44.9	7.4	40.5	77.3	10.8	43.9	43.9
Effective Green, g (s)	35.0	44.2	44.2	37.0	46.2	46.2	7.6	41.8	78.8	11.0	45.2	45.2
Actuated g/C Ratio	0.23	0.29	0.29	0.25	0.31	0.31	0.05	0.28	0.53	0.07	0.30	0.30
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	801	1498	466	1231	1566	488	90	1417	1538	366	1532	477
v/s Ratio Prot	0.29	c0.38		0.17	0.21		0.03	0.34	c0.32	c0.08	c0.07	
v/s Ratio Perm			0.03			0.32			0.39			0.06
v/c Ratio	1.24	1.29	0.11	0.70	0.70	1.03	0.50	1.23	1.29	1.13	0.24	0.21
Uniform Delay, d1	57.5	52.9	38.5	51.5	45.7	51.9	69.3	54.1	35.6	69.5	39.5	39.1
Progression Factor	1.01	0.85	0.71	0.97	0.72	0.66	1.13	0.83	0.84	1.00	1.00	1.00
Incremental Delay, d2	119.3	133.7	0.4	1.3	1.9	42.5	1.4	106.0	131.6	88.6	0.1	0.2
Delay (s)	177.4	178.7	27.9	51.4	34.8	76.6	79.5	151.0	161.5	158.1	39.5	39.3
Level of Service	F	F	C	D	C	E	E	F	F	F	D	D
Approach Delay (s)		175.2			50.2			155.7			83.4	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM Average Control Delay	127.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	118.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.97	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4570	1335		4497	1274				3303		2682
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4570	1335		4497	1274				3303		2682
Volume (vph)	0	2516	2022	0	1217	262	0	0	0	265	0	990
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2648	2128	0	1281	276	0	0	0	279	0	1042
RTOR Reduction (vph)	0	26	0	0	0	0	0	0	0	0	0	92
Lane Group Flow (vph)	0	3294	1456	0	1281	276	0	0	0	279	0	950
Heavy Vehicles (%)	4%	4%	4%	9%	9%	9%	2%	2%	2%	6%	6%	6%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		94.7	150.0		94.7	150.0				45.4		45.4
Effective Green, g (s)		96.0	150.0		96.0	150.0				46.0		46.0
Actuated g/C Ratio		0.64	1.00		0.64	1.00				0.31		0.31
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		2925	1335		2878	1274				1013		822
v/s Ratio Prot		0.72			0.28							
v/s Ratio Perm			c1.09			0.22				0.08		0.35
v/c Ratio		1.13	1.09		0.45	0.22				0.28		1.16
Uniform Delay, d1		27.0	75.0		13.6	0.0				39.4		52.0
Progression Factor		0.65	1.00		0.41	1.00				1.00		1.00
Incremental Delay, d2		57.2	42.2		0.2	0.2				0.1		83.6
Delay (s)		74.8	117.2		5.8	0.2				39.5		135.6
Level of Service		E	F		A	A				D		F
Approach Delay (s)		87.7			4.8			0.0			115.3	
Approach LOS		F			A			A			F	

Intersection Summary			
HCM Average Control Delay	75.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3303	3406			4456	1263	1588	1588	2632			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3303	3406			4456	1263	1588	1588	2632			
Volume (vph)	1103	1678	0	0	1094	378	385	0	1261	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1161	1766	0	0	1152	398	405	0	1327	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	235	0	0	13	0	0	0
Lane Group Flow (vph)	1161	1766	0	0	1152	163	203	202	1314	0	0	0
Heavy Vehicles (%)	6%	6%	6%	10%	10%	10%	8%	8%	8%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	41.8	79.7			34.4	34.4	60.4	60.4	60.4			
Effective Green, g (s)	42.0	81.0			35.0	35.0	61.0	61.0	61.0			
Actuated g/C Ratio	0.28	0.54			0.23	0.23	0.41	0.41	0.41			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	925	1839			1040	295	646	646	1070			
v/s Ratio Prot	c0.35	0.52			c0.26		0.13	0.13				
v/s Ratio Perm						0.13			c0.50			
v/c Ratio	1.26	0.96			1.11	0.55	0.31	0.31	1.23			
Uniform Delay, d1	54.0	33.0			57.5	50.6	30.3	30.2	44.5			
Progression Factor	0.69	0.50			0.44	0.49	1.00	1.00	1.00			
Incremental Delay, d2	115.7	1.9			59.0	5.3	0.3	0.3	111.0			
Delay (s)	153.1	18.4			84.3	29.9	30.6	30.5	155.5			
Level of Service	F	B			F	C	C	C	F			
Approach Delay (s)		71.8			70.3			126.3			0.0	
Approach LOS		E			E			F			A	

Intersection Summary			
HCM Average Control Delay	86.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.95		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	4803	1495	1687	4757		3183	1639		1626	3215	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	4803	1495	1687	4757		3183	1639		1626	3215	
Volume (vph)	257	2084	492	157	977	139	303	404	210	156	445	37
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	271	2194	518	165	1028	146	319	425	221	164	468	39
RTOR Reduction (vph)	0	0	201	0	13	0	0	13	0	0	5	0
Lane Group Flow (vph)	271	2194	317	165	1161	0	319	633	0	164	502	0
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	10%	10%	10%	11%	11%	11%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	29.0	58.4	58.4	12.8	42.2		33.4	47.7		12.8	27.8	
Effective Green, g (s)	29.2	59.0	59.0	13.0	42.8		33.6	49.0		13.0	28.4	
Actuated g/C Ratio	0.19	0.39	0.39	0.09	0.29		0.22	0.33		0.09	0.19	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	325	1889	588	146	1357		713	535		141	609	
v/s Ratio Prot	0.16	c0.46		c0.10	0.24		0.10	c0.39		c0.10	0.16	
v/s Ratio Perm			0.21									
v/c Ratio	0.83	1.16	0.54	1.13	0.86		0.45	1.18		1.16	0.82	
Uniform Delay, d1	58.1	45.5	35.0	68.5	50.7		50.2	50.5		68.5	58.4	
Progression Factor	0.98	0.96	0.97	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	73.3	0.3	113.7	7.1		0.4	100.4		126.3	8.9	
Delay (s)	58.6	117.0	34.3	182.2	57.8		50.6	150.9		194.8	67.3	
Level of Service	E	F	C	F	E		D	F		F	E	
Approach Delay (s)		97.3			73.1			117.8			98.5	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	95.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	105.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	254	73	62	25	129	157	65	2479	19	84	762	239
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	267	77	65	26	136	165	68	2609	20	88	802	252
RTOR Reduction (vph)	0	0	50	0	0	125	0	0	4	0	0	155
Lane Group Flow (vph)	267	77	15	26	136	40	68	2609	16	88	802	97
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	22.3	33.8	33.8	3.7	15.2	15.2	37.1	85.9	85.9	7.6	56.4	56.4
Effective Green, g (s)	22.5	35.1	35.1	3.9	16.5	16.5	37.3	87.2	87.2	7.8	57.7	57.7
Actuated g/C Ratio	0.15	0.23	0.23	0.03	0.11	0.11	0.25	0.58	0.58	0.05	0.38	0.38
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	266	436	370	46	205	307	440	2057	920	92	1361	609
v/s Ratio Prot	c0.15	0.04		0.01	c0.07		0.04	c0.74		c0.05	0.23	
v/s Ratio Perm			0.01			0.01			0.01			0.06
v/c Ratio	1.00	0.18	0.04	0.57	0.66	0.13	0.15	1.27	0.02	0.96	0.59	0.16
Uniform Delay, d1	63.8	45.9	44.4	72.2	64.1	60.3	44.0	31.4	13.3	70.9	36.7	30.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.51	0.17	1.22	0.33	0.89
Incremental Delay, d2	56.1	0.2	0.0	14.9	7.8	0.2	0.1	122.2	0.0	71.9	1.6	0.5
Delay (s)	119.9	46.1	44.5	87.1	71.9	60.5	31.8	138.1	2.3	158.1	13.7	27.5
Level of Service	F	D	D	F	E	E	C	F	A	F	B	C
Approach Delay (s)		94.0			67.3			134.5			27.8	
Approach LOS		F			E			F			C	

Intersection Summary			
HCM Average Control Delay	99.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.47	1.00	1.00	0.75	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	878	1863	1583	1390	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	32	16	34	20	104	178	238	2353	15	122	642	84
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	17	36	21	109	187	251	2477	16	128	676	88
RTOR Reduction (vph)	0	0	32	0	0	111	0	0	3	0	0	65
Lane Group Flow (vph)	34	17	4	21	109	76	251	2477	13	128	676	23
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	13.7	13.7	13.7	13.7	13.7	13.7	84.0	107.4	107.4	14.1	37.5	37.5
Effective Green, g (s)	15.0	15.0	15.0	15.0	15.0	15.0	84.2	108.7	108.7	14.3	38.8	38.8
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10	0.10	0.56	0.72	0.72	0.10	0.26	0.26
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	88	186	158	139	186	158	994	2565	1147	169	915	409
v/s Ratio Prot		0.01			c0.06		0.14	c0.70		0.07	c0.19	
v/s Ratio Perm	0.04		0.00	0.02		0.05			0.01			0.01
v/c Ratio	0.39	0.09	0.02	0.15	0.59	0.48	0.25	0.97	0.01	0.76	0.74	0.06
Uniform Delay, d1	63.2	61.3	60.9	61.7	64.5	63.8	16.8	18.9	5.7	66.2	51.0	41.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.60	0.31	0.32
Incremental Delay, d2	2.8	0.2	0.1	0.5	4.7	2.3	0.1	11.4	0.0	15.3	4.6	0.2
Delay (s)	66.0	61.5	60.9	62.2	69.2	66.2	17.0	30.3	5.8	54.9	20.2	13.8
Level of Service	E	E	E	E	E	E	B	C	A	D	C	B
Approach Delay (s)		63.0			66.9			28.9			24.6	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM Average Control Delay	31.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.75	1.00	1.00	0.72	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1398	1863	1583	1336	1863	1583
Volume (vph)	120	1472	51	192	909	184	75	50	280	60	10	53
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	126	1549	54	202	957	194	79	53	295	63	11	56
RTOR Reduction (vph)	0	0	13	0	0	55	0	0	266	0	0	51
Lane Group Flow (vph)	126	1549	41	202	957	139	79	53	29	63	11	5
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	15.8	98.0	98.0	23.8	106.0	106.0	13.4	13.4	13.4	13.4	13.4	13.4
Effective Green, g (s)	16.0	99.3	99.3	24.0	107.3	107.3	14.7	14.7	14.7	14.7	14.7	14.7
Actuated g/C Ratio	0.11	0.66	0.66	0.16	0.72	0.72	0.10	0.10	0.10	0.10	0.10	0.10
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	189	2343	1048	283	2532	1132	137	183	155	131	183	155
v/s Ratio Prot	0.07	c0.44		c0.11	0.27			0.03			0.01	
v/s Ratio Perm			0.03			0.09	c0.06		0.02	0.05		0.00
v/c Ratio	0.67	0.66	0.04	0.71	0.38	0.12	0.58	0.29	0.19	0.48	0.06	0.04
Uniform Delay, d1	64.4	15.2	8.8	59.7	8.3	6.7	64.7	62.8	62.2	64.0	61.4	61.2
Progression Factor	1.00	1.00	1.00	0.60	0.78	0.45	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.7	1.3	0.1	6.5	0.3	0.2	5.8	0.9	0.6	2.8	0.1	0.1
Delay (s)	72.1	16.6	8.9	42.4	6.8	3.1	70.4	63.7	62.7	66.8	61.5	61.3
Level of Service	E	B	A	D	A	A	E	E	E	E	E	E
Approach Delay (s)		20.4			11.6			64.3			64.0	
Approach LOS		C			B			E			E	

Intersection Summary			
HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0	4.0	4.0
Lane Util. Factor			1.00	0.95	0.95	1.00
Frt			1.00	1.00	1.00	0.85
Flt Protected			0.95	1.00	1.00	1.00
Satd. Flow (prot)			1770	3539	3539	1583
Flt Permitted			0.28	1.00	1.00	1.00
Satd. Flow (perm)			520	3539	3539	1583
Volume (vph)	0	0	37	1636	976	61
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	39	1722	1027	64
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	39	1722	1027	64
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)			75.0	75.0	75.0	75.0
Effective Green, g (s)			75.0	75.0	75.0	75.0
Actuated g/C Ratio			1.00	1.00	1.00	1.00
Clearance Time (s)			4.5	4.5	4.5	4.5
Vehicle Extension (s)			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)			520	3539	3539	1583
v/s Ratio Prot				c0.49	0.29	
v/s Ratio Perm			0.08			0.04
v/c Ratio			0.08	0.49	0.29	0.04
Uniform Delay, d1			0.0	0.0	0.0	0.0
Progression Factor			1.00	1.00	1.00	1.00
Incremental Delay, d2			0.3	0.5	0.2	0.0
Delay (s)			0.3	0.5	0.2	0.0
Level of Service			A	A	A	A
Approach Delay (s)	0.0			0.5	0.2	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	0.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.90						1.00	0.85	1.00	1.00	
Flt Protected		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1398						3312	1482	1612	1696	
Flt Permitted		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1398						3312	1482	1612	1696	
Volume (vph)	189	6	510	0	0	0	0	466	365	60	468	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	199	6	537	0	0	0	0	491	384	63	493	0
RTOR Reduction (vph)	0	144	0	0	0	0	0	0	275	0	0	0
Lane Group Flow (vph)	0	598	0	0	0	0	0	491	109	63	493	0
Heavy Vehicles (%)	21%	21%	21%	2%	2%	2%	9%	9%	9%	12%	12%	12%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		26.9						16.2	16.2	3.2	23.6	
Effective Green, g (s)		27.5						17.1	17.1	3.4	24.5	
Actuated g/C Ratio		0.46						0.29	0.29	0.06	0.41	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		641						944	422	91	693	
v/s Ratio Prot		c0.43						0.15		0.04	c0.29	
v/s Ratio Perm									0.07			
v/c Ratio		0.93						0.52	0.26	0.69	0.71	
Uniform Delay, d1		15.4						18.0	16.6	27.8	14.8	
Progression Factor		1.00						1.00	1.00	1.05	0.48	
Incremental Delay, d2		20.7						2.0	1.5	6.5	1.8	
Delay (s)		36.1						20.1	18.0	35.7	9.0	
Level of Service		D						C	B	D	A	
Approach Delay (s)		36.1			0.0			19.2			12.0	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	23.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.98		1.00	1.00			0.92	
Flt Protected					0.96		0.95	1.00			1.00	
Satd. Flow (prot)					1569		1656	3312			1600	
Flt Permitted					0.96		0.95	1.00			1.00	
Satd. Flow (perm)					1569		1656	3312			1600	
Volume (vph)	0	0	0	211	3	34	207	448	0	0	317	496
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	222	3	36	218	472	0	0	334	522
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	94	0
Lane Group Flow (vph)	0	0	0	0	251	0	218	472	0	0	762	0
Heavy Vehicles (%)	2%	2%	2%	14%	14%	14%	9%	9%	9%	9%	9%	9%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					9.5		8.3	41.0			28.5	
Effective Green, g (s)					10.1		8.5	41.9			29.4	
Actuated g/C Ratio					0.17		0.14	0.70			0.49	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					264		235	2313			784	
v/s Ratio Prot					c0.16		c0.13	0.14			c0.48	
v/s Ratio Perm												
v/c Ratio					0.95		0.93	0.20			0.97	
Uniform Delay, d1					24.7		25.4	3.2			14.9	
Progression Factor					1.00		0.63	1.94			1.00	
Incremental Delay, d2					41.9		33.1	0.2			26.0	
Delay (s)					66.6		49.2	6.3			40.9	
Level of Service					E		D	A			D	
Approach Delay (s)		0.0			66.6			19.9			40.9	
Approach LOS		A			E			B			D	

Intersection Summary			
HCM Average Control Delay	36.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		1.00						1.00	0.85	1.00	1.00	
Flt Protected		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770						1863	1583	1770	1863	
Flt Permitted		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770						1863	1583	1770	1863	
Volume (vph)	1296	0	32	0	0	0	0	147	183	580	200	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1364	0	34	0	0	0	0	155	193	611	211	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	170	0	0	0
Lane Group Flow (vph)	0	1398	0	0	0	0	0	155	23	611	211	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		84.6						16.2	16.2	35.1	55.5	
Effective Green, g (s)		85.2						17.5	17.5	35.3	56.8	
Actuated g/C Ratio		0.57						0.12	0.12	0.24	0.38	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		1005						217	185	417	705	
v/s Ratio Prot		c0.79						c0.08		c0.35	0.11	
v/s Ratio Perm									0.01			
v/c Ratio		1.39						0.71	0.12	1.47	0.30	
Uniform Delay, d1		32.4						63.8	59.4	57.4	32.7	
Progression Factor		1.00						1.00	1.00	0.85	1.02	
Incremental Delay, d2		181.9						18.2	1.3	213.7	0.4	
Delay (s)		214.3						82.0	60.7	262.4	33.5	
Level of Service		F						F	E	F	C	
Approach Delay (s)		214.3			0.0			70.2			203.6	
Approach LOS		F			A			E			F	

Intersection Summary			
HCM Average Control Delay	191.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.32		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	240.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.88		1.00	1.00		1.00	0.92		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3050		1770	3532		1736	3183		1671	3018	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3050		1770	3532		1736	3183		1671	3018	
Volume (vph)	417	303	1290	698	734	10	5	1078	1334	5	218	399
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	439	319	1358	735	773	11	5	1135	1404	5	229	420
RTOR Reduction (vph)	0	263	0	0	1	0	0	154	0	0	233	0
Lane Group Flow (vph)	439	1414	0	735	783	0	5	2385	0	5	416	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	8%	8%	8%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	35.8	43.3		30.8	38.3		0.8	56.1		0.8	56.1	
Effective Green, g (s)	36.0	44.6		31.0	39.6		1.0	57.4		1.0	57.4	
Actuated g/C Ratio	0.24	0.30		0.21	0.26		0.01	0.38		0.01	0.38	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	417	907		366	932		12	1218		11	1155	
v/s Ratio Prot	0.25	c0.46		c0.42	0.22		0.00	c0.75		0.00	c0.14	
v/s Ratio Perm												
v/c Ratio	1.05	1.88dr		2.01	0.84		0.42	1.80dr		0.45	0.36	
Uniform Delay, d1	57.0	52.7		59.5	52.2		74.2	46.3		74.2	33.2	
Progression Factor	1.00	1.00		1.00	1.00		1.04	0.83		1.00	1.00	
Incremental Delay, d2	58.6	257.1		463.3	6.9		2.1	431.3		27.0	0.9	
Delay (s)	115.6	309.8		522.8	59.1		79.5	469.8		101.3	34.0	
Level of Service	F	F		F	E		E	F		F	C	
Approach Delay (s)		269.5			283.5			469.0			34.5	
Approach LOS		F			F			F			C	

Intersection Summary			
HCM Average Control Delay	324.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	171.5%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.88		1.00	1.00			1.00	0.85
Flt Protected					0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1629		1770	1863			1863	1583
Flt Permitted					0.99		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1629		1770	1863			1863	1583
Volume (vph)	0	0	0	117	0	1010	41	1402	0	0	663	1544
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	123	0	1063	43	1476	0	0	698	1625
RTOR Reduction (vph)	0	0	0	0	11	0	0	0	0	0	0	572
Lane Group Flow (vph)	0	0	0	0	1175	0	43	1476	0	0	698	1053
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					66.4		4.2	73.7			65.3	65.3
Effective Green, g (s)					67.0		4.4	75.0			66.6	66.6
Actuated g/C Ratio					0.45		0.03	0.50			0.44	0.44
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					728		52	932			827	703
v/s Ratio Prot					c0.72		0.02	c0.79			0.37	
v/s Ratio Perm												0.67
v/c Ratio					1.61		0.83	1.58			0.84	1.50
Uniform Delay, d1					41.5		72.4	37.5			37.1	41.7
Progression Factor					1.00		1.29	0.45			0.83	2.93
Incremental Delay, d2					282.6		9.5	263.1			1.0	225.0
Delay (s)					324.1		102.8	279.9			31.8	347.3
Level of Service					F		F	F			C	F
Approach Delay (s)		0.0			324.1			274.8			252.5	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	276.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.60		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	240.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3512	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3512	
Volume (vph)	13	20	11	273	40	25	31	835	546	12	294	16
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	21	12	287	42	26	33	879	575	13	309	17
RTOR Reduction (vph)	0	0	11	0	0	21	0	0	241	0	4	0
Lane Group Flow (vph)	14	21	1	287	42	5	33	879	334	13	322	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	0.8	3.7	3.7	12.4	15.3	15.3	4.8	46.3	46.3	0.8	42.3	
Effective Green, g (s)	1.0	3.9	3.9	12.6	15.5	15.5	5.0	46.5	46.5	1.0	42.5	
Actuated g/C Ratio	0.01	0.05	0.05	0.16	0.19	0.19	0.06	0.58	0.58	0.01	0.53	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	22	91	77	541	361	307	111	1083	920	22	1866	
v/s Ratio Prot	0.01	c0.01		c0.08	0.02		0.02	c0.47		0.01	c0.09	
v/s Ratio Perm			0.00			0.00			0.21			
v/c Ratio	0.64	0.23	0.01	0.53	0.12	0.02	0.30	0.81	0.36	0.59	0.17	
Uniform Delay, d1	39.3	36.6	36.2	31.0	26.6	26.1	35.8	13.3	8.9	39.3	9.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.43	
Incremental Delay, d2	47.5	1.3	0.0	1.0	0.1	0.0	1.5	6.6	1.1	35.6	0.2	
Delay (s)	86.8	37.9	36.2	32.0	26.7	26.1	37.3	19.9	10.0	73.0	4.4	
Level of Service	F	D	D	C	C	C	D	B	B	E	A	
Approach Delay (s)		52.1			30.9			16.5			7.0	
Approach LOS		D			C			B			A	

Intersection Summary			
HCM Average Control Delay	18.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	21	15	307	28	42	831
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	16	323	29	44	875
RTOR Reduction (vph)	0	15	0	0	0	165
Lane Group Flow (vph)	22	1	323	29	44	710
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	2.9	2.9	59.4	66.5	5.1	64.5
Effective Green, g (s)	3.1	3.1	59.6	66.7	5.3	64.9
Actuated g/C Ratio	0.04	0.04	0.74	0.83	0.07	0.81
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	72	61	1319	1553	117	1363
v/s Ratio Prot	c0.01		0.18	0.02	0.02	c0.39
v/s Ratio Perm		0.00				0.06
v/c Ratio	0.31	0.01	0.24	0.02	0.38	0.52
Uniform Delay, d1	37.4	37.0	3.2	1.1	35.8	2.5
Progression Factor	1.00	1.00	0.51	0.57	1.08	10.79
Incremental Delay, d2	2.4	0.1	0.4	0.0	1.5	0.3
Delay (s)	39.8	37.0	2.1	0.7	40.1	26.9
Level of Service	D	D	A	A	D	C
Approach Delay (s)	38.6			1.9	27.5	
Approach LOS	D			A	C	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations	↰	↑↑	↑↑	↱	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	188	664	271	289	131	64
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	198	699	285	304	138	67
RTOR Reduction (vph)	0	0	0	132	0	59
Lane Group Flow (vph)	198	699	285	172	138	8
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	12.7	61.9	45.0	45.0	9.7	9.7
Effective Green, g (s)	12.9	62.1	45.2	45.2	9.9	9.9
Actuated g/C Ratio	0.16	0.78	0.57	0.57	0.12	0.12
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	285	2747	2000	894	219	196
v/s Ratio Prot	c0.11	c0.20	0.08		c0.08	
v/s Ratio Perm				0.11		0.01
v/c Ratio	0.69	0.25	0.14	0.19	0.63	0.04
Uniform Delay, d1	31.7	2.5	8.2	8.5	33.3	30.9
Progression Factor	1.01	0.52	0.16	0.19	1.00	1.00
Incremental Delay, d2	6.0	0.2	0.1	0.5	5.8	0.1
Delay (s)	37.9	1.5	1.5	2.0	39.1	31.0
Level of Service	D	A	A	A	D	C
Approach Delay (s)		9.5	1.8		36.4	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	63	1231	803	182	82	20
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	66	1296	845	192	86	21
RTOR Reduction (vph)	0	0	0	66	0	19
Lane Group Flow (vph)	66	1296	845	126	86	2
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	7.2	63.8	52.4	52.4	7.8	7.8
Effective Green, g (s)	7.4	64.0	52.6	52.6	8.0	8.0
Actuated g/C Ratio	0.09	0.80	0.66	0.66	0.10	0.10
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	164	2831	2327	1041	177	158
v/s Ratio Prot	0.04	c0.37	0.24			
v/s Ratio Perm				0.08	c0.05	0.00
v/c Ratio	0.40	0.46	0.36	0.12	0.49	0.01
Uniform Delay, d1	34.2	2.5	6.2	5.1	34.1	32.4
Progression Factor	1.16	0.77	0.26	0.05	1.00	1.00
Incremental Delay, d2	1.6	0.5	0.4	0.2	2.1	0.0
Delay (s)	41.2	2.5	2.0	0.4	36.2	32.5
Level of Service	D	A	A	A	D	C
Approach Delay (s)		4.3	1.7		35.4	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3494		1770	3536		1770	1723		1770	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.65	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3494		1770	3536		1215	1723		1399	1597	
Volume (vph)	216	1201	112	5	918	5	67	5	5	5	5	96
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	227	1264	118	5	966	5	71	5	5	5	5	101
RTOR Reduction (vph)	0	5	0	0	0	0	0	4	0	0	90	0
Lane Group Flow (vph)	227	1377	0	5	971	0	71	6	0	5	16	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	14.6	58.1		0.8	44.3		8.5	8.5		8.5	8.5	
Effective Green, g (s)	14.8	58.3		1.0	44.5		8.7	8.7		8.7	8.7	
Actuated g/C Ratio	0.18	0.73		0.01	0.56		0.11	0.11		0.11	0.11	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	327	2546		22	1967		132	187		152	174	
v/s Ratio Prot	c0.13	c0.39		0.00	c0.27			0.00			0.01	
v/s Ratio Perm							c0.06			0.00		
v/c Ratio	0.69	0.54		0.23	0.49		0.54	0.03		0.03	0.09	
Uniform Delay, d1	30.5	4.9		39.1	10.9		33.7	31.9		31.9	32.1	
Progression Factor	1.02	0.63		0.79	0.64		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.9	0.8		5.1	0.9		4.2	0.1		0.1	0.2	
Delay (s)	36.9	3.9		36.1	7.8		37.9	31.9		32.0	32.3	
Level of Service	D	A		D	A		D	C		C	C	
Approach Delay (s)		8.5			7.9			37.2			32.3	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3330		1770	3534		1770	1586		1770	1586	
Flt Permitted	0.95	1.00		0.95	1.00		0.69	1.00		0.70	1.00	
Satd. Flow (perm)	1770	3330		1770	3534		1285	1586		1295	1586	
Volume (vph)	216	335	218	59	451	5	178	1	89	5	1	98
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	227	353	229	62	475	5	187	1	94	5	1	103
RTOR Reduction (vph)	0	104	0	0	1	0	0	74	0	0	81	0
Lane Group Flow (vph)	227	478	0	62	479	0	187	21	0	5	23	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	15.0	43.4		6.9	35.3		17.1	17.1		17.1	17.1	
Effective Green, g (s)	15.2	43.6		7.1	35.5		17.3	17.3		17.3	17.3	
Actuated g/C Ratio	0.19	0.55		0.09	0.44		0.22	0.22		0.22	0.22	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	336	1815		157	1568		278	343		280	343	
v/s Ratio Prot	c0.13	0.14		0.04	c0.14			0.01			0.01	
v/s Ratio Perm							c0.15			0.00		
v/c Ratio	0.68	0.26		0.39	0.31		0.67	0.06		0.02	0.07	
Uniform Delay, d1	30.1	9.7		34.4	14.3		28.8	24.9		24.7	24.9	
Progression Factor	1.02	0.31		1.05	0.69		1.31	2.29		1.00	1.00	
Incremental Delay, d2	4.7	0.3		1.4	0.4		4.6	0.1		0.0	0.1	
Delay (s)	35.4	3.3		37.6	10.4		42.2	57.1		24.7	25.0	
Level of Service	D	A		D	B		D	E		C	C	
Approach Delay (s)		12.3			13.5			47.2			25.0	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.85	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3423		1770	1505	1504	1770	1594	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.69	1.00	1.00	0.20	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3423		1284	1505	1504	372	1594	
Volume (vph)	225	342	73	106	361	101	149	3	1245	134	4	96
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	237	360	77	112	380	106	157	3	1311	141	4	101
RTOR Reduction (vph)	0	0	57	0	34	0	0	219	219	0	49	0
Lane Group Flow (vph)	237	360	20	112	452	0	157	439	437	141	56	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	11.8	20.4	20.4	6.4	15.0		40.6	40.6	40.6	40.6	40.6	
Effective Green, g (s)	12.0	20.6	20.6	6.6	15.2		40.8	40.8	40.8	40.8	40.8	
Actuated g/C Ratio	0.15	0.26	0.26	0.08	0.19		0.51	0.51	0.51	0.51	0.51	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	266	911	408	283	650		655	768	767	190	813	
v/s Ratio Prot	c0.13	0.10		0.03	c0.13			0.29			0.03	
v/s Ratio Perm			0.01				0.12		0.29	c0.38		
v/c Ratio	0.89	0.40	0.05	0.40	0.70		0.24	0.57	0.57	0.74	0.07	
Uniform Delay, d1	33.4	24.6	22.3	34.8	30.2		10.9	13.6	13.5	15.5	10.0	
Progression Factor	0.89	0.85	0.67	1.13	0.84		0.60	0.38	0.38	1.00	1.00	
Incremental Delay, d2	28.6	0.3	0.0	4.0	6.0		0.2	0.9	0.9	14.4	0.0	
Delay (s)	58.3	21.2	15.0	43.5	31.5		6.7	6.1	6.0	29.9	10.0	
Level of Service	E	C	B	D	C		A	A	A	C	A	
Approach Delay (s)		33.5			33.7			6.1			21.4	
Approach LOS		C			C			A			C	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3535		1770	1508	1504	1770	1661	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.75	1.00	1.00	0.36	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3535		1389	1508	1504	677	1661	
Volume (vph)	21	1653	47	410	485	4	71	5	583	6	5	12
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	1740	49	432	511	4	75	5	614	6	5	13
RTOR Reduction (vph)	0	0	10	0	1	0	0	226	226	0	11	0
Lane Group Flow (vph)	22	1740	39	432	514	0	75	86	81	6	7	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	2.2	46.0	46.0	10.6	54.4		10.8	10.8	10.8	10.8	10.8	
Effective Green, g (s)	2.4	46.2	46.2	10.8	54.6		11.0	11.0	11.0	11.0	11.0	
Actuated g/C Ratio	0.03	0.58	0.58	0.14	0.68		0.14	0.14	0.14	0.14	0.14	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	53	2044	914	463	2413		191	207	207	93	228	
v/s Ratio Prot	0.01	c0.49		c0.13	0.15			c0.06			0.00	
v/s Ratio Perm			0.02				0.05		0.05	0.01		
v/c Ratio	0.42	0.85	0.04	0.93	0.21		0.39	0.42	0.39	0.06	0.03	
Uniform Delay, d1	38.1	14.0	7.3	34.2	4.7		31.5	31.6	31.4	30.0	29.9	
Progression Factor	1.10	0.77	0.86	1.00	1.00		0.95	0.88	0.88	1.00	1.00	
Incremental Delay, d2	4.0	2.8	0.0	28.1	0.2		1.3	1.3	1.2	0.3	0.1	
Delay (s)	45.9	13.7	6.3	62.3	4.9		31.1	29.2	28.9	30.3	29.9	
Level of Service	D	B	A	E	A		C	C	C	C	C	
Approach Delay (s)		13.8			31.1			29.3			30.0	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑		↱
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2221	21	0	899	0	444
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	2338	22	0	946	0	467
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.53		0.53	0.53
vC, conflicting volume			2360		2811	1169
vC1, stage 1 conf vol					2338	
vC2, stage 2 conf vol					473	
vCu, unblocked vol			2678		3528	434
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	52
cM capacity (veh/h)			81		19	977

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	1169	1169	22	473	473	467
Volume Left	0	0	0	0	0	0
Volume Right	0	0	22	0	0	467
cSH	1700	1700	1700	1700	1700	977
Volume to Capacity	0.69	0.69	0.01	0.28	0.28	0.48
Queue Length 95th (ft)	0	0	0	0	0	66
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	12.0
Lane LOS						B
Approach Delay (s)	0.0			0.0		12.0
Approach LOS						B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1627		1770	1604		1770	3502		1770	3536	
Flt Permitted	0.71	1.00		0.74	1.00		0.65	1.00		0.15	1.00	
Satd. Flow (perm)	1326	1627		1372	1604		1208	3502		275	3536	
Volume (vph)	2	5	26	67	5	61	64	1333	102	27	154	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	5	27	71	5	64	67	1403	107	28	162	1
RTOR Reduction (vph)	0	24	0	0	45	0	0	4	0	0	0	0
Lane Group Flow (vph)	2	8	0	71	24	0	67	1506	0	28	163	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.1	8.1		8.1	8.1		63.5	63.5		63.5	63.5	
Effective Green, g (s)	8.3	8.3		8.3	8.3		63.7	63.7		63.7	63.7	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.80	0.80		0.80	0.80	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	138	169		142	166		962	2788		219	2816	
v/s Ratio Prot		0.00			0.02			c0.43			0.05	
v/s Ratio Perm	0.00			c0.05			0.06			0.10		
v/c Ratio	0.01	0.05		0.50	0.15		0.07	0.54		0.13	0.06	
Uniform Delay, d1	32.2	32.3		33.9	32.6		1.8	2.9		1.8	1.7	
Progression Factor	1.00	1.00		1.00	1.00		0.27	0.27		1.29	0.22	
Incremental Delay, d2	0.0	0.1		2.8	0.4		0.1	0.6		1.2	0.0	
Delay (s)	32.2	32.4		36.6	33.0		0.6	1.4		3.5	0.4	
Level of Service	C	C		D	C		A	A		A	A	
Approach Delay (s)		32.4			34.9			1.3			0.9	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	4.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	42	61	1	21	199	302
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	64	1	22	209	318
RTOR Reduction (vph)	0	11	0	0	0	65
Lane Group Flow (vph)	44	53	1	22	209	253
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	2.8	66.3	1.1	8.1	63.5	63.5
Effective Green, g (s)	3.0	66.7	1.3	8.3	63.7	63.7
Actuated g/C Ratio	0.04	0.83	0.02	0.10	0.80	0.80
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	133	1399	56	367	1409	1260
v/s Ratio Prot	c0.01	0.03	0.00	c0.01	0.12	
v/s Ratio Perm		0.00				c0.16
v/c Ratio	0.33	0.04	0.02	0.06	0.15	0.20
Uniform Delay, d1	37.5	1.1	38.7	32.3	1.9	2.0
Progression Factor	1.00	1.00	0.60	0.61	1.00	1.00
Incremental Delay, d2	1.5	0.0	0.1	0.1	0.2	0.4
Delay (s)	39.0	1.2	23.2	19.7	2.1	2.3
Level of Service	D	A	C	B	A	A
Approach Delay (s)	16.6			19.9	2.2	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	28.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1773		1770	1857		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1773		1770	1857		1770	1863	1583
Volume (vph)	296	38	12	1	16	8	11	323	7	7	137	12
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	312	40	13	1	17	8	12	340	7	7	144	13
RTOR Reduction (vph)	0	0	7	0	6	0	0	1	0	0	0	9
Lane Group Flow (vph)	312	40	6	1	19	0	12	346	0	7	144	4
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	18.5	37.4	37.4	0.8	19.7		1.5	24.2		0.8	23.5	23.5
Effective Green, g (s)	18.7	37.6	37.6	1.0	19.9		1.7	24.4		1.0	23.7	23.7
Actuated g/C Ratio	0.23	0.47	0.47	0.01	0.25		0.02	0.30		0.01	0.30	0.30
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	414	876	744	22	441		38	566		22	552	469
v/s Ratio Prot	c0.18	c0.02		0.00	0.01		0.01	c0.19		0.00	c0.08	
v/s Ratio Perm			0.00									0.00
v/c Ratio	0.75	0.05	0.01	0.05	0.04		0.32	0.61		0.32	0.26	0.01
Uniform Delay, d1	28.5	11.5	11.3	39.0	22.8		38.6	23.8		39.2	21.5	19.9
Progression Factor	0.97	0.91	0.86	1.25	0.71		1.67	0.27		0.77	0.75	0.60
Incremental Delay, d2	7.5	0.1	0.0	0.9	0.2		3.4	1.4		7.9	0.2	0.0
Delay (s)	35.3	10.6	9.8	49.8	16.3		67.7	7.9		38.0	16.4	11.9
Level of Service	D	B	A	D	B		E	A		D	B	B
Approach Delay (s)		31.7			17.6			9.9			17.0	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1751		1770	3520		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1751		1770	3520		1770	3539	1583
Volume (vph)	29	7	16	28	3	2	12	1719	66	2	410	10
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	7	17	29	3	2	13	1809	69	2	432	11
RTOR Reduction (vph)	0	0	16	0	2	0	0	2	0	0	0	3
Lane Group Flow (vph)	31	7	1	29	3	0	13	1876	0	2	432	8
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	5.4	4.3	4.3	2.3	1.2		1.5	55.8		0.8	55.1	55.1
Effective Green, g (s)	5.6	4.5	4.5	2.5	1.4		1.7	56.0		1.0	55.3	55.3
Actuated g/C Ratio	0.07	0.06	0.06	0.03	0.02		0.02	0.70		0.01	0.69	0.69
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	124	105	89	55	31		38	2464		22	2446	1094
v/s Ratio Prot	c0.02	0.00		c0.02	0.00		0.01	c0.53		0.00	c0.12	
v/s Ratio Perm			0.00									0.00
v/c Ratio	0.25	0.07	0.01	0.53	0.10		0.34	0.76		0.09	0.18	0.01
Uniform Delay, d1	35.2	35.8	35.6	38.2	38.7		38.6	7.7		39.1	4.3	3.8
Progression Factor	0.65	0.62	0.38	1.00	1.02		1.14	0.54		0.79	0.97	0.93
Incremental Delay, d2	1.1	0.3	0.0	8.8	1.4		4.6	2.0		1.8	0.2	0.0
Delay (s)	24.0	22.4	13.6	47.0	40.7		48.5	6.2		32.5	4.4	3.6
Level of Service	C	C	B	D	D		D	A		C	A	A
Approach Delay (s)		20.6			46.1			6.5			4.5	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	20	2	52	30	1	237	32	8	7	11	1	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	2	55	32	1	249	34	8	7	12	1	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	251			57			142	385	29	245	288	126
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	251			57			142	385	29	245	288	126
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			98			96	98	99	98	100	99
cM capacity (veh/h)	1315			1548			800	529	1045	676	600	925

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	21	57	32	251	49	18
Volume Left	21	0	32	0	34	12
Volume Right	0	55	0	249	7	5
cSH	1315	1700	1548	1700	760	728
Volume to Capacity	0.02	0.03	0.02	0.15	0.07	0.02
Queue Length 95th (ft)	1	0	2	0	5	2
Control Delay (s)	7.8	0.0	7.4	0.0	10.1	10.1
Lane LOS	A		A		B	B
Approach Delay (s)	2.1		0.8		10.1	10.1
Approach LOS					B	B

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	45	10	16	260	50	5	301	1376	47	5	1153	126
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	11	17	274	53	5	317	1448	49	5	1214	133
RTOR Reduction (vph)	0	0	16	0	0	4	0	0	20	0	0	68
Lane Group Flow (vph)	47	11	1	274	53	1	317	1448	29	5	1214	65
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	7.4	2.3	2.3	15.9	10.8	10.8	12.0	45.0	45.0	0.7	33.7	33.7
Effective Green, g (s)	7.6	2.5	2.5	16.1	11.0	11.0	12.2	45.2	45.2	0.9	33.9	33.9
Actuated g/C Ratio	0.09	0.03	0.03	0.20	0.14	0.14	0.15	0.56	0.56	0.01	0.42	0.42
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	167	58	49	353	254	216	519	1982	887	20	1487	665
v/s Ratio Prot	0.03	0.01		c0.15	c0.03		0.09	c0.41		0.00	c0.34	
v/s Ratio Perm			0.00			0.00			0.02			0.04
v/c Ratio	0.28	0.19	0.01	0.78	0.21	0.00	0.61	0.73	0.03	0.25	0.82	0.10
Uniform Delay, d1	34.0	38.1	37.9	30.6	31.0	30.1	32.0	13.2	8.0	39.6	20.7	14.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	1.6	0.1	10.2	0.4	0.0	2.1	1.4	0.0	6.5	3.6	0.1
Delay (s)	34.9	39.7	38.0	40.8	31.4	30.1	34.2	14.6	8.0	46.0	24.2	14.2
Level of Service	C	D	D	D	C	C	C	B	A	D	C	B
Approach Delay (s)		36.3			39.2			17.9			23.3	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM Average Control Delay	22.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	80.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5072		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.76	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	1770	5072		3433	5085	1583	1410	1863	1583	1380	1863	1583
Volume (vph)	341	1100	20	61	1010	51	116	24	402	14	1	169
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	359	1158	21	64	1063	54	122	25	423	15	1	178
RTOR Reduction (vph)	0	3	0	0	0	34	0	0	118	0	0	136
Lane Group Flow (vph)	359	1176	0	64	1063	20	122	25	305	15	1	42
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	19.4	34.8		13.9	29.3	29.3	18.7	18.7	18.7	18.7	18.7	18.7
Effective Green, g (s)	19.6	35.0		14.1	29.5	29.5	18.9	18.9	18.9	18.9	18.9	18.9
Actuated g/C Ratio	0.25	0.44		0.18	0.37	0.37	0.24	0.24	0.24	0.24	0.24	0.24
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	434	2219		605	1875	584	333	440	374	326	440	374
v/s Ratio Prot	c0.20	c0.23		0.02	c0.21			0.01			0.00	
v/s Ratio Perm						0.01	0.09		c0.19	0.01		0.03
v/c Ratio	0.83	0.53		0.11	0.57	0.03	0.37	0.06	0.82	0.05	0.00	0.11
Uniform Delay, d1	28.6	16.5		27.7	20.2	16.1	25.5	23.7	28.9	23.6	23.3	24.0
Progression Factor	1.00	1.00		0.55	0.51	0.37	1.00	1.00	1.00	0.90	0.79	3.22
Incremental Delay, d2	12.2	0.9		0.1	1.2	0.1	0.7	0.1	12.9	0.1	0.0	0.1
Delay (s)	40.8	17.4		15.2	11.5	6.0	26.2	23.7	41.8	21.2	18.6	77.3
Level of Service	D	B		B	B	A	C	C	D	C	B	E
Approach Delay (s)		22.9			11.5			37.7			72.6	
Approach LOS		C			B			D			E	

Intersection Summary			
HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5065		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5065		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	851	1213	33	195	663	222	24	225	988	79	23	353
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	896	1277	35	205	698	234	25	237	1040	83	24	372
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	39	0	0	124
Lane Group Flow (vph)	896	1309	0	205	698	234	25	237	1001	83	24	248
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	23.9	26.8		16.3	19.2	80.0	6.0	16.3	32.6	3.8	14.1	38.0
Effective Green, g (s)	24.1	27.0		16.5	19.4	80.0	6.2	16.5	33.0	4.0	14.3	38.4
Actuated g/C Ratio	0.30	0.34		0.21	0.24	1.00	0.08	0.21	0.41	0.05	0.18	0.48
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1034	1709		708	1233	1583	137	384	1150	89	333	1338
v/s Ratio Prot	c0.26	0.26		0.06	0.14		0.01	0.13	c0.18	c0.05	0.01	0.06
v/s Ratio Perm						c0.15			0.18			0.03
v/c Ratio	0.87	0.77		0.29	0.57	0.15	0.18	0.62	0.87	0.93	0.07	0.19
Uniform Delay, d1	26.4	23.7		26.8	26.6	0.0	34.5	28.9	21.5	37.9	27.3	11.9
Progression Factor	0.64	0.62		0.53	0.51	1.00	1.00	1.00	1.00	0.85	0.84	0.69
Incremental Delay, d2	7.2	3.1		0.2	1.8	0.2	0.6	2.9	7.4	72.8	0.1	0.1
Delay (s)	24.1	17.7		14.5	15.4	0.2	35.2	31.8	28.9	104.8	23.1	8.3
Level of Service	C	B		B	B	A	D	C	C	F	C	A
Approach Delay (s)		20.3			12.1			29.6			25.7	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5081		1770	5034		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.75	1.00	1.00	0.61	1.00	1.00
Satd. Flow (perm)	1770	5081		1770	5034		1405	1863	1583	1142	1863	1583
Volume (vph)	105	2290	12	68	838	61	44	163	576	23	5	19
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	111	2411	13	72	882	64	46	172	606	24	5	20
RTOR Reduction (vph)	0	1	0	0	10	0	0	0	77	0	0	13
Lane Group Flow (vph)	111	2423	0	72	936	0	46	172	529	24	5	7
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	7.9	36.6		3.2	31.9		27.6	27.6	27.6	27.6	27.6	27.6
Effective Green, g (s)	8.1	36.8		3.4	32.1		27.8	27.8	27.8	27.8	27.8	27.8
Actuated g/C Ratio	0.10	0.46		0.04	0.40		0.35	0.35	0.35	0.35	0.35	0.35
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	179	2337		75	2020		488	647	550	397	647	550
v/s Ratio Prot	0.06	c0.48		c0.04	0.19			0.09			0.00	
v/s Ratio Perm							0.03		c0.33	0.02		0.00
v/c Ratio	0.62	1.04		0.96	0.46		0.09	0.27	0.96	0.06	0.01	0.01
Uniform Delay, d1	34.5	21.6		38.2	17.6		17.6	18.8	25.6	17.4	17.1	17.1
Progression Factor	0.84	0.83		1.00	1.00		1.00	1.00	1.00	0.98	0.98	0.98
Incremental Delay, d2	4.3	25.7		89.9	0.8		0.1	0.2	28.8	0.1	0.0	0.0
Delay (s)	33.1	43.7		128.2	18.4		17.7	19.0	54.4	17.1	16.7	16.8
Level of Service	C	D		F	B		B	B	D	B	B	B
Approach Delay (s)		43.2			26.1			45.0			16.9	
Approach LOS		D			C			D			B	

Intersection Summary			
HCM Average Control Delay	39.3	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱	↰↰	↑↱		↰	↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3155	4673	1455	1671	4803	1495	2993	2971		1480	2906	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3155	4673	1455	1671	4803	1495	2993	2971		1480	2906	
Volume (vph)	154	794	265	120	1902	158	526	289	95	189	405	55
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	162	836	279	126	2002	166	554	304	100	199	426	58
RTOR Reduction (vph)	0	0	207	0	0	75	0	26	0	0	9	0
Lane Group Flow (vph)	162	836	72	126	2002	91	554	378	0	199	475	0
Heavy Vehicles (%)	11%	11%	11%	8%	8%	8%	17%	17%	17%	22%	22%	22%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	7.0	30.4	30.4	28.6	52.0	52.0	23.0	23.8		18.9	20.4	
Effective Green, g (s)	7.2	31.0	31.0	28.8	52.6	52.6	23.2	25.1		19.1	21.0	
Actuated g/C Ratio	0.06	0.26	0.26	0.24	0.44	0.44	0.19	0.21		0.16	0.18	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6	4.6	4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	189	1207	376	401	2105	655	579	621		236	509	
v/s Ratio Prot	c0.05	0.18		0.08	c0.42		c0.19	0.13		0.13	c0.16	
v/s Ratio Perm			0.05			0.06						
v/c Ratio	0.86	0.69	0.19	0.31	0.95	0.14	0.96	0.61		0.84	0.93	
Uniform Delay, d1	55.9	40.2	34.7	37.5	32.5	20.2	47.9	43.0		49.0	48.8	
Progression Factor	1.24	0.91	2.53	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	27.4	3.0	1.0	0.5	11.1	0.4	26.7	1.7		23.0	24.2	
Delay (s)	96.7	39.6	88.7	37.9	43.5	20.6	74.6	44.7		72.0	73.1	
Level of Service	F	D	F	D	D	C	E	D		E	E	
Approach Delay (s)		57.6			41.6			62.0			72.8	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM Average Control Delay	53.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	5068		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	5068		1770	3539	1583
Volume (vph)	209	73	35	3	37	72	62	609	14	30	1780	256
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	220	77	37	3	39	76	65	641	15	32	1874	269
RTOR Reduction (vph)	0	0	29	0	0	69	0	2	0	0	0	85
Lane Group Flow (vph)	220	77	8	3	39	7	65	654	0	32	1874	184
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	15.0	23.2	23.2	0.9	9.1	9.1	10.7	50.3		26.6	66.2	66.2
Effective Green, g (s)	15.2	24.5	24.5	1.1	10.4	10.4	10.9	51.6		26.8	67.5	67.5
Actuated g/C Ratio	0.13	0.20	0.20	0.01	0.09	0.09	0.09	0.43		0.22	0.56	0.56
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3		4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	224	380	323	16	161	242	161	2179		395	1991	890
v/s Ratio Prot	c0.12	c0.04		0.00	0.02		c0.04	0.13		0.02	c0.53	
v/s Ratio Perm			0.00			0.00						0.12
v/c Ratio	0.98	0.20	0.02	0.19	0.24	0.03	0.40	0.30		0.08	0.94	0.21
Uniform Delay, d1	52.3	39.6	38.2	59.0	51.1	50.2	51.5	22.4		36.9	24.4	13.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.95		0.46	0.27	0.00
Incremental Delay, d2	54.8	0.3	0.0	5.6	0.8	0.0	1.6	0.3		0.0	4.2	0.2
Delay (s)	107.0	39.9	38.2	64.6	51.9	50.2	47.6	21.5		16.8	10.8	0.2
Level of Service	F	D	D	E	D	D	D	C		B	B	A
Approach Delay (s)		83.9			51.1			23.9			9.6	
Approach LOS		F			D			C			A	

Intersection Summary			
HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95	1.00	1.00	1.00	
Frt	1.00	0.99						1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1677						3539	1583	1770	1863	
Flt Permitted	0.95	0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1677						3539	1583	1770	1863	
Volume (vph)	720	0	17	0	0	0	0	61	87	34	1229	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	758	0	18	0	0	0	0	64	92	36	1294	0
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	63	0	0	0
Lane Group Flow (vph)	408	366	0	0	0	0	0	64	29	36	1294	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	18.4	18.4						23.5	23.5	24.0	51.7	
Effective Green, g (s)	19.0	19.0						24.8	24.8	24.2	53.0	
Actuated g/C Ratio	0.24	0.24						0.31	0.31	0.30	0.66	
Clearance Time (s)	4.6	4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	399	398						1097	491	535	1234	
v/s Ratio Prot	c0.24	0.22						0.02		0.02	c0.69	
v/s Ratio Perm									0.02			
v/c Ratio	1.02	0.92						0.06	0.06	0.07	1.05	
Uniform Delay, d1	30.5	29.7						19.4	19.4	19.9	13.5	
Progression Factor	1.00	1.00						1.00	1.00	0.55	0.31	
Incremental Delay, d2	50.9	25.7						0.1	0.2	0.0	30.8	
Delay (s)	81.4	55.5						19.5	19.6	10.9	34.9	
Level of Service	F	E						B	B	B	C	
Approach Delay (s)		69.1			0.0			19.6			34.3	
Approach LOS		E			A			B			C	

Intersection Summary			
HCM Average Control Delay	45.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1656	3312	1482	3433	3539	1583	1671	3343	2632	1543	3085	2429
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1656	3312	1482	3433	3539	1583	1671	3343	2632	1543	3085	2429
Volume (vph)	51	248	1	737	741	3	219	238	786	9	539	737
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	54	261	1	776	780	3	231	251	827	9	567	776
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	547	0	0	371
Lane Group Flow (vph)	54	261	1	776	780	1	231	251	280	9	567	405
Heavy Vehicles (%)	9%	9%	9%	2%	2%	2%	8%	8%	8%	17%	17%	17%
Turn Type	Prot		Free	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	4.1	11.3	80.0	23.1	30.3	30.3	13.1	25.8	25.8	0.8	13.5	13.5
Effective Green, g (s)	4.3	12.6	80.0	23.3	31.6	31.6	13.3	27.1	27.1	1.0	14.8	14.8
Actuated g/C Ratio	0.05	0.16	1.00	0.29	0.40	0.40	0.17	0.34	0.34	0.01	0.18	0.18
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	89	522	1482	1000	1398	625	278	1132	892	19	571	449
v/s Ratio Prot	0.03	c0.08		c0.23	0.22		c0.14	0.08		0.01	c0.18	
v/s Ratio Perm			0.00			0.00			0.11			0.17
v/c Ratio	0.61	0.50	0.00	0.78	0.56	0.00	0.83	0.22	0.31	0.47	0.99	0.90
Uniform Delay, d1	37.0	30.8	0.0	26.0	18.8	14.7	32.3	18.9	19.6	39.2	32.5	31.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.60	0.40	0.40	1.00	1.00	1.00
Incremental Delay, d2	11.2	0.8	0.0	3.8	0.5	0.0	16.8	0.4	0.8	17.5	36.0	24.0
Delay (s)	48.2	31.6	0.0	29.8	19.3	14.7	36.2	8.0	8.6	56.7	68.5	55.9
Level of Service	D	C	A	C	B	B	D	A	A	E	E	E
Approach Delay (s)		34.3			24.5			13.4			61.2	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM Average Control Delay	32.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					0.95	0.95	1.00	0.95			1.00	1.00
Frt					0.95	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.97	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1630	1504	1770	3539			1863	1583
Flt Permitted					0.97	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1630	1504	1770	3539			1863	1583
Volume (vph)	0	0	0	200	0	462	10	771	0	0	1063	214
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	211	0	486	11	812	0	0	1119	225
RTOR Reduction (vph)	0	0	0	0	21	170	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	287	219	11	812	0	0	1119	225
Turn Type				Split		Perm	Prot					Free
Protected Phases				8	8		5	2			6	
Permitted Phases						8						Free
Actuated Green, G (s)					18.5	18.5	0.9	51.6			46.5	80.0
Effective Green, g (s)					19.1	19.1	1.1	52.9			47.8	80.0
Actuated g/C Ratio					0.24	0.24	0.01	0.66			0.60	1.00
Clearance Time (s)					4.6	4.6	4.2	5.3			5.3	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					389	359	24	2340			1113	1583
v/s Ratio Prot					c0.18		0.01	c0.23			c0.60	
v/s Ratio Perm						0.15						0.14
v/c Ratio					0.74	0.61	0.46	0.35			1.01	0.14
Uniform Delay, d1					28.1	27.1	39.2	6.0			16.1	0.0
Progression Factor					1.00	1.00	1.19	0.35			0.30	1.00
Incremental Delay, d2					7.2	3.1	5.6	0.2			21.9	0.1
Delay (s)					35.3	30.2	52.3	2.3			26.7	0.1
Level of Service					D	C	D	A			C	A
Approach Delay (s)		0.0			32.5			2.9			22.2	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3242	4803	1495	1687	4848	1509	3183	3113		1626	3215	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3242	4803	1495	1687	4848	1509	3183	3113		1626	3215	
Volume (vph)	257	2084	492	157	977	139	303	404	210	156	445	37
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	271	2194	518	165	1028	146	319	425	221	164	468	39
RTOR Reduction (vph)	0	0	189	0	0	108	0	51	0	0	5	0
Lane Group Flow (vph)	271	2194	329	165	1028	38	319	595	0	164	502	0
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	10%	10%	10%	11%	11%	11%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	40.2	59.8	59.8	13.5	33.1	33.1	15.6	24.5		13.9	23.5	
Effective Green, g (s)	40.4	60.4	60.4	13.7	33.7	33.7	15.8	25.8		14.1	24.1	
Actuated g/C Ratio	0.31	0.46	0.46	0.11	0.26	0.26	0.12	0.20		0.11	0.19	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6	4.6	4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1008	2232	695	178	1257	391	387	618		176	596	
v/s Ratio Prot	0.08	c0.46		c0.10	0.21		0.10	c0.19		0.10	c0.16	
v/s Ratio Perm			0.22			0.03						
v/c Ratio	0.27	0.98	0.47	0.93	0.82	0.10	0.82	0.96		0.93	0.84	
Uniform Delay, d1	33.7	34.3	23.9	57.7	45.3	36.6	55.7	51.6		57.5	51.1	
Progression Factor	0.96	0.93	0.91	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	3.0	0.2	46.4	6.0	0.5	13.3	26.9		48.2	10.5	
Delay (s)	32.3	35.0	22.1	104.1	51.3	37.1	69.0	78.5		105.7	61.6	
Level of Service	C	C	C	F	D	D	E	E		F	E	
Approach Delay (s)		32.5			56.2			75.4			72.4	
Approach LOS		C			E			E			E	

Intersection Summary			
HCM Average Control Delay	49.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	5079		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	5079		1770	3539	1583
Volume (vph)	254	73	62	25	129	157	65	2479	19	84	762	239
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	267	77	65	26	136	165	68	2609	20	88	802	252
RTOR Reduction (vph)	0	0	48	0	0	145	0	0	0	0	0	164
Lane Group Flow (vph)	267	77	17	26	136	20	68	2629	0	88	802	88
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	24.1	37.3	37.3	3.7	16.9	16.9	39.2	80.0		10.0	50.8	50.8
Effective Green, g (s)	24.3	38.6	38.6	3.9	18.2	18.2	39.4	81.3		10.2	52.1	52.1
Actuated g/C Ratio	0.16	0.26	0.26	0.03	0.12	0.12	0.26	0.54		0.07	0.35	0.35
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3		4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	287	479	407	46	226	338	465	2753		120	1229	550
v/s Ratio Prot	c0.15	0.04		0.01	c0.07		0.04	c0.52		0.05	c0.23	
v/s Ratio Perm			0.01			0.01						0.06
v/c Ratio	0.93	0.16	0.04	0.57	0.60	0.06	0.15	0.95		0.73	0.65	0.16
Uniform Delay, d1	62.0	43.2	41.8	72.2	62.5	58.3	42.4	32.6		68.6	41.3	33.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.62	0.52		1.00	1.00	1.00
Incremental Delay, d2	35.1	0.2	0.0	14.9	4.5	0.1	0.1	4.0		20.5	2.7	0.6
Delay (s)	97.1	43.3	41.9	87.1	66.9	58.4	26.4	20.9		89.1	44.0	34.4
Level of Service	F	D	D	F	E	E	C	C		F	D	C
Approach Delay (s)		78.2			64.2			21.0			45.4	
Approach LOS		E			E			C			D	

Intersection Summary			
HCM Average Control Delay	35.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95	1.00	1.00	1.00	
Frt	1.00	0.99						1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1676						3539	1583	1770	1863	
Flt Permitted	0.95	0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1676						3539	1583	1770	1863	
Volume (vph)	1296	0	32	0	0	0	0	147	183	580	200	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1364	0	34	0	0	0	0	155	193	611	211	0
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	173	0	0	0
Lane Group Flow (vph)	737	659	0	0	0	0	0	155	20	611	211	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	52.1	52.1						10.0	10.0	33.8	48.0	
Effective Green, g (s)	52.7	52.7						11.3	11.3	34.0	49.3	
Actuated g/C Ratio	0.48	0.48						0.10	0.10	0.31	0.45	
Clearance Time (s)	4.6	4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	805	803						364	163	547	835	
v/s Ratio Prot	c0.44	0.39						c0.04		c0.35	0.11	
v/s Ratio Perm									0.01			
v/c Ratio	0.92	0.82						0.43	0.12	1.12	0.25	
Uniform Delay, d1	26.6	24.6						46.3	44.8	38.0	18.9	
Progression Factor	1.00	1.00						1.00	1.00	0.71	0.67	
Incremental Delay, d2	14.9	6.8						3.6	1.5	65.0	0.4	
Delay (s)	41.5	31.4						49.9	46.4	92.0	13.1	
Level of Service	D	C						D	D	F	B	
Approach Delay (s)		36.7			0.0			47.9			71.7	
Approach LOS		D			A			D			E	

Intersection Summary			
HCM Average Control Delay	49.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3471	1553	3433	3539	1583	1736	3471	2733	1671	3343	2632
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1736	3471	1553	3433	3539	1583	1736	3471	2733	1671	3343	2632
Volume (vph)	417	303	1290	698	734	10	5	1078	1334	5	218	399
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	439	319	1358	735	773	11	5	1135	1404	5	229	420
RTOR Reduction (vph)	0	0	0	0	0	8	0	0	860	0	0	289
Lane Group Flow (vph)	439	319	1358	735	773	3	5	1135	544	5	229	131
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	8%	8%	8%
Turn Type	Prot		Free	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	27.9	14.9	110.0	42.2	29.2	29.2	0.8	33.1	33.1	0.8	33.1	33.1
Effective Green, g (s)	28.1	16.2	110.0	42.4	30.5	30.5	1.0	34.4	34.4	1.0	34.4	34.4
Actuated g/C Ratio	0.26	0.15	1.00	0.39	0.28	0.28	0.01	0.31	0.31	0.01	0.31	0.31
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	511	1553	1323	981	439	16	1085	855	15	1045	823
v/s Ratio Prot	0.25	0.09		0.21	0.22		0.00	c0.33		0.00	0.07	
v/s Ratio Perm			c0.87			0.00			0.20			0.05
v/c Ratio	0.99	0.62	0.87	0.56	0.79	0.01	0.31	1.05	0.64	0.33	0.22	0.16
Uniform Delay, d1	40.8	44.0	0.0	26.4	36.8	28.8	54.2	37.8	32.4	54.2	27.9	27.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.03	0.90	0.75	1.00	1.00	1.00
Incremental Delay, d2	40.2	2.4	7.2	0.5	4.3	0.0	5.4	32.4	1.8	12.7	0.5	0.4
Delay (s)	81.1	46.4	7.2	26.9	41.0	28.8	61.4	66.3	26.1	66.8	28.4	27.8
Level of Service	F	D	A	C	D	C	E	E	C	E	C	C
Approach Delay (s)		28.4			34.1			44.1			28.3	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM Average Control Delay	35.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					0.95	0.95	1.00	0.95			1.00	1.00
Frt					0.88	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.99	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1541	1504	1770	3539			1863	1583
Flt Permitted					0.99	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1541	1504	1770	3539			1863	1583
Volume (vph)	0	0	0	117	0	1010	41	1402	0	0	663	1544
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	123	0	1063	43	1476	0	0	698	1625
RTOR Reduction (vph)	0	0	0	0	10	10	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	616	550	43	1476	0	0	698	1625
Turn Type				Split		Perm	Prot					Free
Protected Phases				8	8		5	2			6	
Permitted Phases						8						Free
Actuated Green, G (s)					45.6	45.6	3.4	54.5			46.9	110.0
Effective Green, g (s)					46.2	46.2	3.6	55.8			48.2	110.0
Actuated g/C Ratio					0.42	0.42	0.03	0.51			0.44	1.00
Clearance Time (s)					4.6	4.6	4.2	5.3			5.3	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					647	632	58	1795			816	1583
v/s Ratio Prot					0.40		0.02	0.42			0.37	
v/s Ratio Perm						0.37						c1.03
v/c Ratio					0.95	0.87	0.74	0.82			0.86	1.03
Uniform Delay, d1					30.8	29.1	52.7	22.9			27.8	55.0
Progression Factor					1.00	1.00	1.40	0.10			0.80	1.00
Incremental Delay, d2					23.9	12.2	23.5	2.4			8.1	26.0
Delay (s)					54.7	41.3	97.5	4.8			30.4	81.0
Level of Service					D	D	F	A			C	F
Approach Delay (s)		0.0			48.4			7.4			65.8	
Approach LOS		A			D			A			E	

Intersection Summary			
HCM Average Control Delay	44.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Appendix H – Level of Service Worksheets: Year 2031 Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	230	837	41	1587	1450	469	55	445	705	662	1009	867
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	242	881	43	1671	1526	494	58	468	742	697	1062	913
RTOR Reduction (vph)	0	0	20	0	0	331	0	0	4	0	0	247
Lane Group Flow (vph)	242	881	23	1671	1526	163	58	468	738	697	1062	666
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.3	18.8	18.8	37.0	37.5	37.5	4.3	24.1	61.1	21.1	40.9	40.9
Effective Green, g (s)	18.5	20.1	20.1	37.2	38.8	38.8	4.5	25.4	62.6	21.3	42.2	42.2
Actuated g/C Ratio	0.15	0.17	0.17	0.31	0.32	0.32	0.04	0.21	0.52	0.18	0.35	0.35
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	529	852	265	1547	1644	512	66	1076	1454	886	1788	557
v/s Ratio Prot	0.07	c0.17		c0.33	0.30		c0.03	0.09	0.16	0.14	0.21	
v/s Ratio Perm			0.01			0.10			0.11			c0.42
v/c Ratio	0.46	1.03	0.09	1.08	0.93	0.32	0.88	0.43	0.51	0.79	0.59	1.20
Uniform Delay, d1	46.2	50.0	42.2	41.4	39.3	30.6	57.5	41.1	18.7	47.2	31.9	38.9
Progression Factor	0.89	0.95	0.95	0.93	0.89	0.56	0.75	0.71	1.34	1.00	1.00	1.00
Incremental Delay, d2	0.6	38.6	0.6	37.4	1.2	0.1	64.4	0.3	0.3	4.7	0.5	104.7
Delay (s)	41.5	85.9	40.7	76.1	36.3	17.3	107.6	29.4	25.3	51.8	32.4	143.6
Level of Service	D	F	D	E	D	B	F	C	C	D	C	F
Approach Delay (s)		75.0			51.8			30.6			75.5	
Approach LOS		E			D			C			E	

Intersection Summary			
HCM Average Control Delay	59.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.99	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4783	1375		4456	1263				3155		2561
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4783	1375		4456	1263				3155		2561
Volume (vph)	0	1102	1126	0	1829	522	0	0	0	272	0	2062
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1160	1185	0	1925	549	0	0	0	286	0	2171
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1275	1060	0	1925	549	0	0	0	286	0	2171
Heavy Vehicles (%)	1%	1%	1%	10%	10%	10%	2%	2%	2%	11%	11%	11%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		39.7	120.0		39.7	120.0				70.4		70.4
Effective Green, g (s)		41.0	120.0		41.0	120.0				71.0		71.0
Actuated g/C Ratio		0.34	1.00		0.34	1.00				0.59		0.59
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		1634	1375		1522	1263				1867		1515
v/s Ratio Prot		0.27			c0.43							
v/s Ratio Perm			0.77			0.43				0.09		c0.85
v/c Ratio		0.78	0.77		1.26	0.43				0.15		1.43
Uniform Delay, d1		35.5	0.0		39.5	0.0				11.0		24.5
Progression Factor		0.58	1.00		0.48	1.00				1.00		1.00
Incremental Delay, d2		2.3	2.6		122.1	0.6				0.0		198.6
Delay (s)		22.9	2.6		140.9	0.6				11.0		223.1
Level of Service		C	A		F	A				B		F
Approach Delay (s)		13.7			109.7			0.0			198.4	
Approach LOS		B			F			A			F	

Intersection Summary			
HCM Average Control Delay	108.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.37		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	118.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3273	3374			4456	1263	1466	1472	2429			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3273	3374			4456	1263	1466	1472	2429			
Volume (vph)	476	898	0	0	2071	458	280	5	469	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	501	945	0	0	2180	482	295	5	494	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	176	0	0	336	0	0	0
Lane Group Flow (vph)	501	945	0	0	2180	306	148	152	158	0	0	0
Heavy Vehicles (%)	7%	7%	7%	10%	10%	10%	17%	17%	17%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	21.4	93.8			68.9	68.9	16.3	16.3	16.3			
Effective Green, g (s)	21.6	95.1			69.5	69.5	16.9	16.9	16.9			
Actuated g/C Ratio	0.18	0.79			0.58	0.58	0.14	0.14	0.14			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	589	2674			2581	731	206	207	342			
v/s Ratio Prot	c0.15	0.28			c0.49		0.10	c0.10				
v/s Ratio Perm						0.24			0.07			
v/c Ratio	0.85	0.35			0.84	0.42	0.72	0.73	0.46			
Uniform Delay, d1	47.6	3.6			20.8	14.0	49.3	49.4	47.4			
Progression Factor	0.54	0.35			0.29	0.34	1.00	1.00	1.00			
Incremental Delay, d2	8.7	0.3			0.3	0.2	11.3	12.6	1.0			
Delay (s)	34.3	1.5			6.4	5.0	60.6	62.0	48.4			
Level of Service	C	A			A	A	E	E	D			
Approach Delay (s)		12.9			6.2			53.3			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1626	4673	1455	1671	4758		2993	1577		1480	2903	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1626	4673	1455	1671	4758		2993	1577		1480	2903	
Volume (vph)	154	801	265	121	1911	127	526	402	96	189	405	59
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	162	843	279	127	2012	134	554	423	101	199	426	62
RTOR Reduction (vph)	0	0	212	0	6	0	0	7	0	0	10	0
Lane Group Flow (vph)	162	843	67	127	2140	0	554	517	0	199	478	0
Heavy Vehicles (%)	11%	11%	11%	8%	8%	8%	17%	17%	17%	22%	22%	22%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	9.8	28.3	28.3	28.9	47.4		23.6	31.7		12.8	21.6	
Effective Green, g (s)	10.0	28.9	28.9	29.1	48.0		23.8	33.0		13.0	22.2	
Actuated g/C Ratio	0.08	0.24	0.24	0.24	0.40		0.20	0.28		0.11	0.18	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	136	1125	350	405	1903		594	434		160	537	
v/s Ratio Prot	c0.10	0.18		0.08	c0.45		0.19	c0.33		c0.13	0.16	
v/s Ratio Perm			0.05									
v/c Ratio	1.19	0.75	0.19	0.31	1.12		0.93	1.19		1.24	0.89	
Uniform Delay, d1	55.0	42.2	36.3	37.3	36.0		47.3	43.5		53.5	47.7	
Progression Factor	0.80	0.86	2.04	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	133.4	4.1	1.1	0.4	63.6		21.7	106.6		151.3	16.8	
Delay (s)	177.3	40.3	74.9	37.7	99.6		69.0	150.1		204.8	64.5	
Level of Service	F	D	E	D	F		E	F		F	E	
Approach Delay (s)		65.1			96.1			108.5			105.1	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	92.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	275	84	100	4	36	71	87	674	22	39	1707	298
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	289	88	105	4	38	75	92	709	23	41	1797	314
RTOR Reduction (vph)	0	0	80	0	0	69	0	0	12	0	0	106
Lane Group Flow (vph)	289	88	25	4	38	6	92	709	11	41	1797	208
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.8	26.9	26.9	0.9	9.0	9.0	13.2	55.2	55.2	18.0	60.0	60.0
Effective Green, g (s)	19.0	28.2	28.2	1.1	10.3	10.3	13.4	56.5	56.5	18.2	61.3	61.3
Actuated g/C Ratio	0.16	0.24	0.24	0.01	0.09	0.09	0.11	0.47	0.47	0.15	0.51	0.51
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	280	438	372	16	160	239	198	1666	745	268	1808	809
v/s Ratio Prot	c0.16	c0.05		0.00	0.02		0.05	c0.20		0.02	c0.51	
v/s Ratio Perm			0.02			0.00			0.01			0.13
v/c Ratio	1.03	0.20	0.07	0.25	0.24	0.03	0.46	0.43	0.01	0.15	0.99	0.26
Uniform Delay, d1	50.5	36.9	35.7	59.0	51.2	50.3	49.9	21.0	16.9	44.2	29.2	16.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.93	0.79	0.59	0.31	0.07
Incremental Delay, d2	62.4	0.2	0.1	8.1	0.8	0.0	1.7	0.8	0.0	0.1	12.8	0.3
Delay (s)	112.9	37.1	35.7	67.1	52.0	50.3	45.6	20.4	13.5	26.4	21.8	1.5
Level of Service	F	D	D	E	D	D	D	C	B	C	C	A
Approach Delay (s)		82.2			51.4			23.0			18.9	
Approach LOS		F			D			C			B	

Intersection Summary			
HCM Average Control Delay	29.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.75	1.00	1.00	0.73	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1393	1863	1583	1364	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	79	36	174	22	14	184	15	519	14	58	1706	22
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	83	38	183	23	15	194	16	546	15	61	1796	23
RTOR Reduction (vph)	0	0	118	0	0	172	0	0	4	0	0	6
Lane Group Flow (vph)	83	38	65	23	15	22	16	546	11	61	1796	17
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	12.2	12.2	12.2	12.2	12.2	12.2	3.1	84.6	84.6	8.4	89.9	89.9
Effective Green, g (s)	13.5	13.5	13.5	13.5	13.5	13.5	3.3	85.9	85.9	8.6	91.2	91.2
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11	0.11	0.03	0.72	0.72	0.07	0.76	0.76
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	157	210	178	153	210	178	49	2533	1133	127	2690	1203
v/s Ratio Prot		0.02			0.01		0.01	0.15		c0.03	c0.51	
v/s Ratio Perm	c0.06		0.04	0.02		0.01			0.01			0.01
v/c Ratio	0.53	0.18	0.36	0.15	0.07	0.12	0.33	0.22	0.01	0.48	0.67	0.01
Uniform Delay, d1	50.2	48.2	49.3	48.1	47.6	47.9	57.3	5.7	4.9	53.6	7.0	3.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.37	0.20	0.00
Incremental Delay, d2	3.2	0.4	1.3	0.5	0.1	0.3	3.9	0.2	0.0	1.2	0.6	0.0
Delay (s)	53.4	48.7	50.6	48.5	47.8	48.2	61.1	5.9	4.9	74.6	1.9	0.0
Level of Service	D	D	D	D	D	D	E	A	A	E	A	A
Approach Delay (s)		51.1			48.2			7.4			4.3	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1332	1863	1583	1372	1863	1583
Volume (vph)	54	569	45	102	2171	67	89	30	269	204	61	294
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	57	599	47	107	2285	71	94	32	283	215	64	309
RTOR Reduction (vph)	0	0	18	0	0	19	0	0	232	0	0	50
Lane Group Flow (vph)	57	599	29	107	2285	52	94	32	51	215	64	259
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	3.8	73.1	73.1	11.9	81.2	81.2	20.2	20.2	20.2	20.2	20.2	20.2
Effective Green, g (s)	4.0	74.4	74.4	12.1	82.5	82.5	21.5	21.5	21.5	21.5	21.5	21.5
Actuated g/C Ratio	0.03	0.62	0.62	0.10	0.69	0.69	0.18	0.18	0.18	0.18	0.18	0.18
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	59	2194	981	178	2433	1088	239	334	284	246	334	284
v/s Ratio Prot	c0.03	0.17		0.06	c0.65			0.02			0.03	
v/s Ratio Perm			0.02			0.03	0.07		0.03	0.16		c0.16
v/c Ratio	0.97	0.27	0.03	0.60	0.94	0.05	0.39	0.10	0.18	0.87	0.19	0.91
Uniform Delay, d1	57.9	10.4	8.8	51.6	16.5	6.1	43.5	41.1	41.8	47.9	41.9	48.3
Progression Factor	0.93	0.88	0.76	1.21	0.64	0.17	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	103.1	0.3	0.1	0.5	1.0	0.0	1.1	0.1	0.3	27.2	0.3	31.3
Delay (s)	157.1	9.5	6.8	62.7	11.6	1.0	44.6	41.3	42.1	75.1	42.1	79.6
Level of Service	F	A	A	E	B	A	D	D	D	E	D	E
Approach Delay (s)		21.3			13.5			42.6			73.9	
Approach LOS		C			B			D			E	

Intersection Summary			
HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.04	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	71	3539	3539	1583
Volume (vph)	67	19	14	601	2549	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	71	20	15	633	2683	5
RTOR Reduction (vph)	0	14	0	0	0	1
Lane Group Flow (vph)	71	6	15	633	2683	4
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)	6.8	6.8	104.2	104.2	104.2	104.2
Effective Green, g (s)	7.3	7.3	104.7	104.7	104.7	104.7
Actuated g/C Ratio	0.06	0.06	0.87	0.87	0.87	0.87
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	108	96	62	3088	3088	1381
v/s Ratio Prot	c0.04			0.18	c0.76	
v/s Ratio Perm		0.00	0.21			0.00
v/c Ratio	0.66	0.06	0.24	0.20	0.87	0.00
Uniform Delay, d1	55.1	53.1	1.2	1.2	4.0	1.0
Progression Factor	1.00	1.00	1.00	1.00	0.45	0.36
Incremental Delay, d2	13.5	0.3	9.0	0.2	1.5	0.0
Delay (s)	68.7	53.4	10.3	1.3	3.3	0.3
Level of Service	E	D	B	A	A	A
Approach Delay (s)	65.3			1.5	3.3	
Approach LOS	E			A	A	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.91						1.00	0.85	1.00	1.00	
Flt Protected		0.98						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1371						2888	1292	1583	1667	
Flt Permitted		0.98						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1371						2888	1292	1583	1667	
Volume (vph)	75	3	162	0	0	0	0	404	252	51	405	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	3	171	0	0	0	0	425	265	54	426	0
RTOR Reduction (vph)	0	137	0	0	0	0	0	0	103	0	0	0
Lane Group Flow (vph)	0	116	0	0	0	0	0	425	162	54	426	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	25%	25%	25%	14%	14%	14%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		10.7						41.8	41.8	3.8	49.8	
Effective Green, g (s)		11.3						42.7	42.7	4.0	50.7	
Actuated g/C Ratio		0.16						0.61	0.61	0.06	0.72	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		221						1762	788	90	1207	
v/s Ratio Prot		c0.08						0.15		c0.03	c0.26	
v/s Ratio Perm									0.13			
v/c Ratio		0.53						0.24	0.21	0.60	0.35	
Uniform Delay, d1		26.9						6.2	6.1	32.2	3.6	
Progression Factor		1.00						1.00	1.00	0.89	0.93	
Incremental Delay, d2		2.3						0.3	0.6	1.0	0.1	
Delay (s)		29.2						6.6	6.7	29.6	3.4	
Level of Service		C						A	A	C	A	
Approach Delay (s)		29.2			0.0			6.6			6.3	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	117.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.96		1.00	1.00			0.89	
Flt Protected					0.97		0.95	1.00			1.00	
Satd. Flow (prot)					1534		1388	2777			1426	
Flt Permitted					0.97		0.95	1.00			1.00	
Satd. Flow (perm)					1534		1388	2777			1426	
Volume (vph)	0	0	0	233	5	99	159	320	0	0	223	860
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	245	5	104	167	337	0	0	235	905
RTOR Reduction (vph)	0	0	0	0	21	0	0	0	0	0	198	0
Lane Group Flow (vph)	0	0	0	0	333	0	167	337	0	0	942	0
Heavy Vehicles (%)	2%	2%	2%	15%	15%	15%	30%	30%	30%	19%	19%	19%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					12.4		7.8	48.1			36.1	
Effective Green, g (s)					13.0		8.0	49.0			37.0	
Actuated g/C Ratio					0.19		0.11	0.70			0.53	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					285		159	1944			754	
v/s Ratio Prot					c0.22		c0.12	0.12			c0.66	
v/s Ratio Perm												
v/c Ratio					1.17		1.05	0.17			1.25	
Uniform Delay, d1					28.5		31.0	3.6			16.5	
Progression Factor					1.00		0.88	0.63			0.87	
Incremental Delay, d2					106.6		84.2	0.2			113.3	
Delay (s)					135.1		111.4	2.4			127.7	
Level of Service					F		F	A			F	
Approach Delay (s)		0.0			135.1			38.6			127.7	
Approach LOS		A			F			D			F	

Intersection Summary			
HCM Average Control Delay	106.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	117.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		1.00						1.00	0.85	1.00	1.00	
Flt Protected		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770						1863	1583	1770	1863	
Flt Permitted		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770						1863	1583	1770	1863	
Volume (vph)	748	0	18	0	0	0	0	54	88	398	1203	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	787	0	19	0	0	0	0	57	93	419	1266	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	86	0	0	0
Lane Group Flow (vph)	0	805	0	0	0	0	0	57	7	419	1266	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		52.4						9.4	9.4	64.1	77.7	
Effective Green, g (s)		53.0						10.7	10.7	64.3	79.0	
Actuated g/C Ratio		0.38						0.08	0.08	0.46	0.56	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		670						142	121	813	1051	
v/s Ratio Prot		c0.45						0.03		0.24	c0.68	
v/s Ratio Perm									0.00			
v/c Ratio		1.20						0.40	0.06	0.52	1.20	
Uniform Delay, d1		43.5						61.6	60.0	26.8	30.5	
Progression Factor		1.00						1.00	1.00	0.27	0.18	
Incremental Delay, d2		104.8						8.2	0.9	0.0	93.0	
Delay (s)		148.3						69.8	60.9	7.3	98.5	
Level of Service		F						E	E	A	F	
Approach Delay (s)		148.3			0.0			64.3			75.8	
Approach LOS		F			A			E			E	

Intersection Summary			
HCM Average Control Delay	97.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	142.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00		1.00	1.00		1.00	0.88		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1656	3310		1770	3537		1671	2945		1543	2846	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1656	3310		1770	3537		1671	2945		1543	2846	
Volume (vph)	31	244	1	999	731	3	551	202	775	8	689	741
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	257	1	1052	769	3	580	213	816	8	725	780
RTOR Reduction (vph)	0	0	0	0	0	0	0	410	0	0	110	0
Lane Group Flow (vph)	33	258	0	1052	772	0	580	619	0	8	1395	0
Heavy Vehicles (%)	9%	9%	9%	2%	2%	2%	8%	8%	8%	17%	17%	17%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	4.3	17.5		39.8	53.0		26.1	62.9		0.8	37.6	
Effective Green, g (s)	4.5	18.8		40.0	54.3		26.3	64.2		1.0	38.9	
Actuated g/C Ratio	0.03	0.13		0.29	0.39		0.19	0.46		0.01	0.28	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	53	444		506	1372		314	1350		11	791	
v/s Ratio Prot	0.02	0.08		c0.59	c0.22		c0.35	0.21		0.01	c0.49	
v/s Ratio Perm												
v/c Ratio	0.62	0.58		2.08	0.56		1.85	0.46		0.73	1.76	
Uniform Delay, d1	66.9	56.9		50.0	33.6		56.8	26.0		69.4	50.6	
Progression Factor	0.92	0.99		1.00	1.00		1.10	1.43		1.00	1.00	
Incremental Delay, d2	19.3	1.8		492.3	0.5		382.3	0.1		123.5	348.9	
Delay (s)	81.1	58.4		542.3	34.1		444.9	37.2		192.9	399.5	
Level of Service	F	E		F	C		F	D		F	F	
Approach Delay (s)		60.9			327.2			184.1			398.4	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	289.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.66		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	148.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.90		1.00	1.00			1.00	0.85
Flt Protected					0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1650		1770	1863			1863	1583
Flt Permitted					0.99		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1650		1770	1863			1863	1583
Volume (vph)	0	0	0	216	0	726	10	792	0	0	1385	446
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	227	0	764	11	834	0	0	1458	469
RTOR Reduction (vph)	0	0	0	0	82	0	0	0	0	0	0	95
Lane Group Flow (vph)	0	0	0	0	909	0	11	834	0	0	1458	374
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					54.5		1.7	75.6			69.7	69.7
Effective Green, g (s)					55.1		1.9	76.9			71.0	71.0
Actuated g/C Ratio					0.39		0.01	0.55			0.51	0.51
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					649		24	1023			945	803
v/s Ratio Prot					c0.55		0.01	c0.45			c0.78	
v/s Ratio Perm												0.24
v/c Ratio					1.40		0.46	0.82			1.54	0.47
Uniform Delay, d1					42.4		68.5	25.8			34.5	22.3
Progression Factor					1.00		1.28	1.51			0.21	0.07
Incremental Delay, d2					189.6		1.3	0.7			244.8	0.2
Delay (s)					232.0		88.8	39.5			252.1	1.8
Level of Service					F		F	D			F	A
Approach Delay (s)		0.0			232.0			40.1			191.2	
Approach LOS		A			F			D			F	

Intersection Summary			
HCM Average Control Delay	168.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.44		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	142.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3536	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3536	
Volume (vph)	5	5	5	485	5	5	5	30	164	5	737	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	5	511	5	5	5	32	173	5	776	5
RTOR Reduction (vph)	0	0	5	0	0	4	0	0	71	0	0	0
Lane Group Flow (vph)	5	5	0	511	5	1	5	32	102	5	781	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	0.8	1.3	1.3	17.7	18.2	18.2	0.8	52.9	52.9	1.3	53.4	
Effective Green, g (s)	1.0	1.5	1.5	17.9	18.4	18.4	1.0	53.1	53.1	1.5	53.6	
Actuated g/C Ratio	0.01	0.02	0.02	0.20	0.20	0.20	0.01	0.59	0.59	0.02	0.60	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	20	31	26	683	381	324	20	1099	934	30	2106	
v/s Ratio Prot	0.00	c0.00		c0.15	0.00		0.00	0.02		0.00	c0.22	
v/s Ratio Perm			0.00			0.00			c0.06			
v/c Ratio	0.25	0.16	0.00	0.75	0.01	0.00	0.25	0.03	0.11	0.17	0.37	
Uniform Delay, d1	44.1	43.6	43.5	33.9	28.6	28.5	44.1	7.7	8.1	43.6	9.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.17	0.40	
Incremental Delay, d2	6.5	2.4	0.0	4.5	0.0	0.0	6.5	0.0	0.2	2.4	0.5	
Delay (s)	50.6	46.1	43.6	38.4	28.6	28.5	50.6	7.7	8.3	53.4	4.2	
Level of Service	D	D	D	D	C	C	D	A	A	D	A	
Approach Delay (s)		46.7			38.2			9.2			4.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	5	5	737	5	5	30
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	776	5	5	32
RTOR Reduction (vph)	0	5	0	0	0	5
Lane Group Flow (vph)	5	0	776	5	5	27
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	1.3	1.3	74.8	80.3	1.3	76.1
Effective Green, g (s)	1.5	1.5	75.0	80.5	1.5	76.5
Actuated g/C Ratio	0.02	0.02	0.83	0.89	0.02	0.85
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	31	26	1475	1666	30	1416
v/s Ratio Prot	c0.00		c0.44	0.00	c0.00	0.02
v/s Ratio Perm		0.00				0.00
v/c Ratio	0.16	0.00	0.53	0.00	0.17	0.02
Uniform Delay, d1	43.6	43.5	2.2	0.5	43.6	1.0
Progression Factor	1.00	1.00	0.55	0.36	1.16	0.17
Incremental Delay, d2	2.4	0.0	1.3	0.0	2.6	0.0
Delay (s)	46.1	43.6	2.5	0.2	53.4	0.2
Level of Service	D	D	A	A	D	A
Approach Delay (s)	44.8			2.5	7.4	
Approach LOS	D			A	A	

Intersection Summary			
HCM Average Control Delay	3.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	30	5	587	65	224	187
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	5	618	68	236	197
RTOR Reduction (vph)	0	0	0	24	0	160
Lane Group Flow (vph)	32	5	618	44	236	37
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	3.2	65.1	57.7	57.7	16.5	16.5
Effective Green, g (s)	3.4	65.3	57.9	57.9	16.7	16.7
Actuated g/C Ratio	0.04	0.73	0.64	0.64	0.19	0.19
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	67	2568	2277	1018	328	294
v/s Ratio Prot	c0.02	0.00	c0.17		c0.13	
v/s Ratio Perm				0.03		0.02
v/c Ratio	0.48	0.00	0.27	0.04	0.72	0.12
Uniform Delay, d1	42.4	3.4	6.9	5.9	34.4	30.6
Progression Factor	1.07	1.87	0.80	0.86	1.00	1.00
Incremental Delay, d2	5.3	0.0	0.3	0.1	7.4	0.2
Delay (s)	50.6	6.3	5.8	5.2	41.8	30.7
Level of Service	D	A	A	A	D	C
Approach Delay (s)		44.6	5.7		36.8	
Approach LOS		D	A		D	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	8	337	1027	40	145	67
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	355	1081	42	153	71
RTOR Reduction (vph)	0	0	0	12	0	61
Lane Group Flow (vph)	8	355	1081	30	153	10
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	1.3	69.0	63.5	63.5	12.6	12.6
Effective Green, g (s)	1.5	69.2	63.7	63.7	12.8	12.8
Actuated g/C Ratio	0.02	0.77	0.71	0.71	0.14	0.14
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	30	2721	2505	1120	252	225
v/s Ratio Prot	0.00	c0.10	c0.31			
v/s Ratio Perm				0.02	c0.09	0.01
v/c Ratio	0.27	0.13	0.43	0.03	0.61	0.04
Uniform Delay, d1	43.7	2.7	5.5	3.9	36.2	33.3
Progression Factor	1.04	2.28	0.29	0.18	1.00	1.00
Incremental Delay, d2	4.3	0.1	0.5	0.0	4.1	0.1
Delay (s)	49.6	6.2	2.1	0.7	40.3	33.4
Level of Service	D	A	A	A	D	C
Approach Delay (s)		7.1	2.0		38.1	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.92		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3468		1770	3537		1770	1723		1770	1591	
Flt Permitted	0.95	1.00		0.95	1.00		0.45	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3468		1770	3537		845	1723		1399	1591	
Volume (vph)	43	417	65	5	947	5	120	5	5	5	5	171
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	439	68	5	997	5	126	5	5	5	5	180
RTOR Reduction (vph)	0	8	0	0	0	0	0	4	0	0	149	0
Lane Group Flow (vph)	45	499	0	5	1002	0	126	6	0	5	36	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	7.0	60.8		1.3	55.1		15.3	15.3		15.3	15.3	
Effective Green, g (s)	7.2	61.0		1.5	55.3		15.5	15.5		15.5	15.5	
Actuated g/C Ratio	0.08	0.68		0.02	0.61		0.17	0.17		0.17	0.17	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	142	2351		30	2173		146	297		241	274	
v/s Ratio Prot	c0.03	0.14		0.00	c0.28			0.00			0.02	
v/s Ratio Perm							c0.15			0.00		
v/c Ratio	0.32	0.21		0.17	0.46		0.86	0.02		0.02	0.13	
Uniform Delay, d1	39.1	5.5		43.6	9.3		36.2	30.9		30.9	31.5	
Progression Factor	0.92	1.32		1.10	0.66		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.2		2.6	0.7		37.5	0.0		0.0	0.2	
Delay (s)	37.2	7.4		50.6	6.8		73.7	31.0		31.0	31.8	
Level of Service	D	A		D	A		E	C		C	C	
Approach Delay (s)		9.8			7.0			70.6			31.7	
Approach LOS		A			A			E			C	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3441		1770	3529		1770	1619		1770	1591	
Flt Permitted	0.95	1.00		0.95	1.00		0.51	1.00		0.73	1.00	
Satd. Flow (perm)	1770	3441		1770	3529		948	1619		1363	1591	
Volume (vph)	43	235	53	88	255	5	190	5	32	5	5	172
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	247	56	93	268	5	200	5	34	5	5	181
RTOR Reduction (vph)	0	14	0	0	1	0	0	26	0	0	141	0
Lane Group Flow (vph)	45	289	0	93	272	0	200	13	0	5	45	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	7.3	48.3		9.4	50.4		19.7	19.7		19.7	19.7	
Effective Green, g (s)	7.5	48.5		9.6	50.6		19.9	19.9		19.9	19.9	
Actuated g/C Ratio	0.08	0.54		0.11	0.56		0.22	0.22		0.22	0.22	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	148	1854		189	1984		210	358		301	352	
v/s Ratio Prot	0.03	c0.08		c0.05	0.08			0.01			0.03	
v/s Ratio Perm							c0.21			0.00		
v/c Ratio	0.30	0.16		0.49	0.14		0.95	0.03		0.02	0.13	
Uniform Delay, d1	38.8	10.4		37.9	9.3		34.6	27.5		27.4	28.1	
Progression Factor	1.20	1.11		0.85	1.20		1.20	1.72		1.00	1.00	
Incremental Delay, d2	1.2	0.2		1.9	0.1		48.4	0.0		0.0	0.2	
Delay (s)	47.7	11.7		34.1	11.3		89.8	47.3		27.4	28.3	
Level of Service	D	B		C	B		F	D		C	C	
Approach Delay (s)		16.4			17.1			82.9			28.2	
Approach LOS		B			B			F			C	

Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.87	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3413		1770	1537	1504	1770	1585	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.39	1.00	1.00	0.73	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3413		723	1537	1504	1359	1585	
Volume (vph)	43	148	115	1274	294	91	48	5	67	49	1	174
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	45	156	121	1341	309	96	51	5	71	52	1	183
RTOR Reduction (vph)	0	0	105	0	25	0	0	31	32	0	162	0
Lane Group Flow (vph)	45	156	16	1341	380	0	51	9	4	52	22	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	5.4	11.7	11.7	55.6	61.9		10.1	10.1	10.1	10.1	10.1	
Effective Green, g (s)	5.6	11.9	11.9	55.8	62.1		10.3	10.3	10.3	10.3	10.3	
Actuated g/C Ratio	0.06	0.13	0.13	0.62	0.69		0.11	0.11	0.11	0.11	0.11	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	110	468	209	2128	2355		83	176	172	156	181	
v/s Ratio Prot	0.03	c0.04		c0.39	0.11			0.01			0.01	
v/s Ratio Perm			0.01				c0.07		0.00	0.04		
v/c Ratio	0.41	0.33	0.08	0.63	0.16		0.61	0.05	0.02	0.33	0.12	
Uniform Delay, d1	40.6	35.4	34.2	10.7	4.9		38.0	35.5	35.4	36.7	35.8	
Progression Factor	1.12	0.58	0.82	0.66	0.97		0.51	0.26	0.26	1.00	1.00	
Incremental Delay, d2	2.5	0.4	0.2	1.1	0.1		12.7	0.1	0.1	1.3	0.3	
Delay (s)	47.8	21.0	28.2	8.2	4.9		32.1	9.3	9.4	38.0	36.1	
Level of Service	D	C	C	A	A		C	A	A	D	D	
Approach Delay (s)		27.4			7.4			18.4			36.5	
Approach LOS		C			A			B			D	

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3538		1770	1515	1504	1770	1630	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.74	1.00	1.00	0.51	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3538		1374	1515	1504	948	1630	
Volume (vph)	5	253	5	870	1602	4	71	5	232	2	5	24
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	266	5	916	1686	4	75	5	244	2	5	25
RTOR Reduction (vph)	0	0	4	0	0	0	0	108	108	0	22	0
Lane Group Flow (vph)	5	266	1	916	1690	0	75	19	14	2	8	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	0.8	21.7	21.7	45.9	66.8		9.8	9.8	9.8	9.8	9.8	
Effective Green, g (s)	1.0	21.9	21.9	46.1	67.0		10.0	10.0	10.0	10.0	10.0	
Actuated g/C Ratio	0.01	0.24	0.24	0.51	0.74		0.11	0.11	0.11	0.11	0.11	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	20	861	385	1758	2634		153	168	167	105	181	
v/s Ratio Prot	0.00	c0.08		0.27	c0.48			0.01			0.00	
v/s Ratio Perm			0.00				c0.05		0.01	0.00		
v/c Ratio	0.25	0.31	0.00	0.52	0.64		0.49	0.11	0.08	0.02	0.04	
Uniform Delay, d1	44.1	27.9	25.8	14.6	5.6		37.6	36.0	35.9	35.6	35.7	
Progression Factor	0.73	0.47	0.46	1.00	1.00		0.99	0.96	0.99	1.00	1.00	
Incremental Delay, d2	6.2	0.2	0.0	1.1	1.2		2.5	0.3	0.2	0.1	0.1	
Delay (s)	38.5	13.3	11.9	15.7	6.8		39.7	34.7	35.9	35.7	35.8	
Level of Service	D	B	B	B	A		D	C	D	D	D	
Approach Delay (s)		13.7			10.0			36.3			35.8	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑		↱
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	474	15	0	2476	0	69
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	499	16	0	2606	0	73
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.98		0.98	0.98
vC, conflicting volume			515		1802	249
vC1, stage 1 conf vol					499	
vC2, stage 2 conf vol					1303	
vCu, unblocked vol			477		1797	205
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	96
cM capacity (veh/h)			1055		169	1688

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	249	249	16	1303	1303	73
Volume Left	0	0	0	0	0	0
Volume Right	0	0	16	0	0	73
cSH	1700	1700	1700	1700	1700	1688
Volume to Capacity	0.15	0.15	0.01	0.77	0.77	0.04
Queue Length 95th (ft)	0	0	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	7.2
Lane LOS						A
Approach Delay (s)	0.0			0.0		7.2
Approach LOS						A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.88		1.00	0.93		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1606		1770	1632		1770	3290		1770	3539	
Flt Permitted	0.74	1.00		0.72	1.00		0.17	1.00		0.64	1.00	
Satd. Flow (perm)	1375	1606		1336	1632		312	3290		1183	3539	
Volume (vph)	1	5	53	109	5	23	50	93	83	25	1324	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1	5	56	115	5	24	53	98	87	26	1394	1
RTOR Reduction (vph)	0	45	0	0	21	0	0	19	0	0	0	0
Lane Group Flow (vph)	1	16	0	115	8	0	53	166	0	26	1395	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.0	11.0		11.0	11.0		70.6	70.6		70.6	70.6	
Effective Green, g (s)	11.2	11.2		11.2	11.2		70.8	70.8		70.8	70.8	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.79	0.79		0.79	0.79	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	171	200		166	203		245	2588		931	2784	
v/s Ratio Prot		0.01			0.00			0.05			c0.39	
v/s Ratio Perm	0.00			c0.09			0.17			0.02		
v/c Ratio	0.01	0.08		0.69	0.04		0.22	0.06		0.03	0.50	
Uniform Delay, d1	34.5	34.9		37.8	34.7		2.5	2.2		2.1	3.4	
Progression Factor	1.00	1.00		1.00	1.00		2.06	0.03		0.11	0.08	
Incremental Delay, d2	0.0	0.2		11.8	0.1		2.0	0.0		0.0	0.5	
Delay (s)	34.5	35.0		49.6	34.7		7.1	0.1		0.3	0.8	
Level of Service	C	D		D	C		A	A		A	A	
Approach Delay (s)		35.0			46.6			1.7			0.8	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	5.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	5	44	44	14	5	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	46	46	15	5	5
RTOR Reduction (vph)	0	8	0	0	0	1
Lane Group Flow (vph)	5	38	46	15	5	4
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	1.2	73.1	4.3	9.7	71.9	71.9
Effective Green, g (s)	1.4	73.5	4.5	9.9	72.1	72.1
Actuated g/C Ratio	0.02	0.82	0.05	0.11	0.80	0.80
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	55	1363	172	389	1418	1268
v/s Ratio Prot	c0.00	c0.02	c0.01	0.00	0.00	
v/s Ratio Perm		0.00				0.00
v/c Ratio	0.09	0.03	0.27	0.04	0.00	0.00
Uniform Delay, d1	43.7	1.5	41.2	35.8	1.8	1.8
Progression Factor	1.00	1.00	0.90	0.87	0.31	0.09
Incremental Delay, d2	0.7	0.0	0.8	0.0	0.0	0.0
Delay (s)	44.4	1.6	37.7	31.2	0.6	0.2
Level of Service	D	A	D	C	A	A
Approach Delay (s)	5.8			36.1	0.4	
Approach LOS	A			D	A	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.04		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1739		1770	1859		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1739		1770	1859		1770	1863	1583
Volume (vph)	5	5	5	9	5	4	3	77	1	5	412	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	5	9	5	4	3	81	1	5	434	53
RTOR Reduction (vph)	0	0	3	0	2	0	0	1	0	0	0	27
Lane Group Flow (vph)	5	5	2	9	7	0	3	81	0	5	434	26
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	1.3	39.2	39.2	1.7	39.6		1.3	31.0		1.3	31.0	31.0
Effective Green, g (s)	1.5	39.4	39.4	1.9	39.8		1.5	31.2		1.5	31.2	31.2
Actuated g/C Ratio	0.02	0.44	0.44	0.02	0.44		0.02	0.35		0.02	0.35	0.35
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	30	816	693	37	769		30	644		30	646	549
v/s Ratio Prot	c0.00	0.00		c0.01	c0.00		0.00	c0.04		0.00	c0.23	
v/s Ratio Perm			0.00									0.02
v/c Ratio	0.17	0.01	0.00	0.24	0.01		0.10	0.13		0.17	0.67	0.05
Uniform Delay, d1	43.6	14.3	14.2	43.3	14.1		43.6	20.1		43.6	25.0	19.5
Progression Factor	1.15	1.32	1.48	1.01	0.99		0.89	0.21		1.05	0.86	0.65
Incremental Delay, d2	2.6	0.0	0.0	3.4	0.0		1.3	0.1		2.6	2.7	0.0
Delay (s)	53.0	18.9	21.0	47.2	13.9		40.1	4.3		48.3	24.2	12.8
Level of Service	D	B	C	D	B		D	A		D	C	B
Approach Delay (s)		30.9			30.6			5.6			23.2	
Approach LOS		C			C			A			C	

Intersection Summary			
HCM Average Control Delay	21.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↱		↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1770		1770	3521		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1770		1770	3521		1770	3539	1583
Volume (vph)	1	5	5	97	2	1	4	383	13	2	1727	12
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1	5	5	102	2	1	4	403	14	2	1818	13
RTOR Reduction (vph)	0	0	5	0	1	0	0	2	0	0	0	1
Lane Group Flow (vph)	1	5	0	102	2	0	4	415	0	2	1818	12
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	1.2	1.3	1.3	10.1	10.2		0.8	60.6		1.2	61.0	61.0
Effective Green, g (s)	1.4	1.5	1.5	10.3	10.4		1.0	60.8		1.4	61.2	61.2
Actuated g/C Ratio	0.02	0.02	0.02	0.11	0.12		0.01	0.68		0.02	0.68	0.68
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	28	31	26	203	205		20	2379		28	2407	1076
v/s Ratio Prot	0.00	c0.00		c0.06	0.00		0.00	c0.12		0.00	c0.51	
v/s Ratio Perm			0.00									0.01
v/c Ratio	0.04	0.16	0.00	0.50	0.01		0.20	0.17		0.07	0.76	0.01
Uniform Delay, d1	43.6	43.6	43.5	37.4	35.2		44.1	5.4		43.7	9.5	4.6
Progression Factor	0.86	0.50	0.40	1.00	1.01		1.17	0.39		1.07	0.56	0.85
Incremental Delay, d2	0.5	2.4	0.0	2.0	0.0		4.5	0.1		1.0	2.1	0.0
Delay (s)	38.1	24.4	17.6	39.5	35.6		56.1	2.2		47.8	7.4	4.0
Level of Service	D	C	B	D	D		E	A		D	A	A
Approach Delay (s)		22.6			39.4			2.8			7.4	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	5	14	5	5	29	54	1	12	115	6	45
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	5	15	5	5	31	57	1	13	121	6	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	36			20			89	69	13	60	62	21
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	36			20			89	69	13	60	62	21
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			93	100	99	87	99	96
cM capacity (veh/h)	1575			1596			846	816	1068	919	824	1057

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	20	5	36	71	175
Volume Left	5	0	5	0	57	121
Volume Right	0	15	0	31	13	47
cSH	1575	1700	1596	1700	878	949
Volume to Capacity	0.00	0.01	0.00	0.02	0.08	0.18
Queue Length 95th (ft)	0	0	0	0	7	17
Control Delay (s)	7.3	0.0	7.3	0.0	9.5	9.6
Lane LOS	A		A		A	A
Approach Delay (s)	1.5		0.9		9.5	9.6
Approach LOS					A	A

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	20.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	40	5	44	29	5	5	5	941	87	5	1424	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	5	46	31	5	5	5	991	92	5	1499	5
RTOR Reduction (vph)	0	0	45	0	0	5	0	0	25	0	0	1
Lane Group Flow (vph)	42	5	1	31	5	0	5	991	67	5	1499	4
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	4.8	2.4	2.4	4.2	1.8	1.8	5.7	65.3	65.3	1.3	60.9	60.9
Effective Green, g (s)	5.0	2.6	2.6	4.4	2.0	2.0	5.9	65.5	65.5	1.5	61.1	61.1
Actuated g/C Ratio	0.06	0.03	0.03	0.05	0.02	0.02	0.07	0.73	0.73	0.02	0.68	0.68
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	98	54	46	87	41	35	225	2576	1152	30	2403	1075
v/s Ratio Prot	c0.02	0.00		c0.02	0.00		0.00	c0.28		c0.00	c0.42	
v/s Ratio Perm			0.00			0.00			0.04			0.00
v/c Ratio	0.43	0.09	0.03	0.36	0.12	0.00	0.02	0.38	0.06	0.17	0.62	0.00
Uniform Delay, d1	41.1	42.6	42.5	41.4	43.1	43.0	39.4	4.6	3.5	43.6	8.0	4.7
Progression Factor	0.94	1.08	1.31	1.00	1.00	1.00	1.00	1.00	1.00	1.34	0.67	0.26
Incremental Delay, d2	3.0	0.7	0.3	2.5	1.3	0.0	0.0	0.4	0.1	2.4	1.1	0.0
Delay (s)	41.8	46.5	56.1	43.9	44.5	43.1	39.4	5.1	3.6	60.7	6.5	1.2
Level of Service	D	D	E	D	D	D	D	A	A	E	A	A
Approach Delay (s)		49.1			43.9			5.1			6.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4944		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	4944		3433	5085	1583	1389	1863	1583	1405	1863	1583
Volume (vph)	92	726	164	438	951	4	34	5	32	17	17	443
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	97	764	173	461	1001	4	36	5	34	18	18	466
RTOR Reduction (vph)	0	33	0	0	0	2	0	0	26	0	0	265
Lane Group Flow (vph)	97	904	0	461	1001	2	36	5	8	18	18	201
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	8.9	36.5		20.3	47.9	47.9	20.6	20.6	20.6	20.6	20.6	20.6
Effective Green, g (s)	9.1	36.7		20.5	48.1	48.1	20.8	20.8	20.8	20.8	20.8	20.8
Actuated g/C Ratio	0.10	0.41		0.23	0.53	0.53	0.23	0.23	0.23	0.23	0.23	0.23
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	179	2016		782	2718	846	321	431	366	325	431	366
v/s Ratio Prot	c0.05	c0.18		c0.13	0.20			0.00			0.01	
v/s Ratio Perm						0.00	0.03		0.00	0.01		c0.13
v/c Ratio	0.54	0.45		0.59	0.37	0.00	0.11	0.01	0.02	0.06	0.04	0.55
Uniform Delay, d1	38.5	19.3		31.0	12.1	9.8	27.3	26.7	26.7	26.9	26.9	30.5
Progression Factor	0.87	0.81		0.86	0.89	1.13	1.00	1.00	1.00	1.45	1.44	3.40
Incremental Delay, d2	3.2	0.7		0.9	0.3	0.0	0.2	0.0	0.0	0.1	0.0	1.4
Delay (s)	36.6	16.3		27.5	11.1	11.1	27.5	26.7	26.8	39.1	38.8	104.8
Level of Service	D	B		C	B	B	C	C	C	D	D	F
Approach Delay (s)		18.2			16.3			27.1			100.1	
Approach LOS		B			B			C			F	

Intersection Summary			
HCM Average Control Delay	30.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5053		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5053		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	338	362	16	1030	1145	58	24	10	71	184	292	897
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	356	381	17	1084	1205	61	25	11	75	194	307	944
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	42	0	0	81
Lane Group Flow (vph)	356	392	0	1084	1205	61	25	11	34	194	307	863
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	17.8	15.8		36.2	34.2	90.0	1.6	3.6	39.8	17.6	19.6	37.4
Effective Green, g (s)	18.0	16.0		36.4	34.4	90.0	1.8	3.8	40.2	17.8	19.8	37.8
Actuated g/C Ratio	0.20	0.18		0.40	0.38	1.00	0.02	0.04	0.45	0.20	0.22	0.42
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	687	898		1388	1944	1583	35	79	1369	350	410	1171
v/s Ratio Prot	0.10	0.08		c0.32	0.24		0.01	0.01	0.01	c0.11	c0.16	c0.15
v/s Ratio Perm						c0.04			0.00			0.16
v/c Ratio	0.52	0.44		0.78	0.62	0.04	0.71	0.14	0.02	0.55	0.75	0.74
Uniform Delay, d1	32.1	33.0		23.3	22.5	0.0	43.8	41.5	13.9	32.5	32.8	21.9
Progression Factor	0.45	0.41		0.83	0.79	1.00	1.00	1.00	1.00	0.85	0.76	0.59
Incremental Delay, d2	0.6	1.4		2.4	1.2	0.0	51.0	0.8	0.0	1.4	5.5	1.8
Delay (s)	15.1	14.8		21.6	19.0	0.0	94.8	42.3	13.9	28.9	30.3	14.9
Level of Service	B	B		C	B	A	F	D	B	C	C	B
Approach Delay (s)		14.9			19.7			35.0			20.0	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4988		1770	5073		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.68	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	4988		1770	5073		1263	1863	1583	1405	1863	1583
Volume (vph)	8	427	63	733	2346	40	13	5	84	13	85	74
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	449	66	772	2469	42	14	5	88	14	89	78
RTOR Reduction (vph)	0	20	0	0	1	0	0	0	80	0	0	71
Lane Group Flow (vph)	8	495	0	772	2510	0	14	5	8	14	89	7
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	0.8	22.8		46.5	68.5		8.1	8.1	8.1	8.1	8.1	8.1
Effective Green, g (s)	1.0	23.0		46.7	68.7		8.3	8.3	8.3	8.3	8.3	8.3
Actuated g/C Ratio	0.01	0.26		0.52	0.76		0.09	0.09	0.09	0.09	0.09	0.09
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	20	1275		918	3872		116	172	146	130	172	146
v/s Ratio Prot	0.00	c0.10		c0.44	c0.49			0.00			c0.05	
v/s Ratio Perm							0.01		0.01	0.01		0.00
v/c Ratio	0.40	0.39		0.84	0.65		0.12	0.03	0.06	0.11	0.52	0.05
Uniform Delay, d1	44.2	27.7		18.5	5.0		37.5	37.2	37.3	37.5	38.9	37.3
Progression Factor	0.61	0.46		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.02
Incremental Delay, d2	11.9	0.8		7.0	0.9		0.5	0.1	0.2	0.4	2.6	0.1
Delay (s)	38.8	13.7		25.5	5.8		38.0	37.3	37.4	37.9	41.7	38.2
Level of Service	D	B		C	A		D	D	D	D	D	D
Approach Delay (s)		14.0			10.5			37.5			39.9	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	1093	1864	74	824	1080	668	42	1380	2113	695	609	301
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1151	1962	78	867	1137	703	44	1453	2224	732	641	317
RTOR Reduction (vph)	0	0	15	0	0	116	0	0	0	0	0	226
Lane Group Flow (vph)	1151	1962	63	867	1137	587	44	1453	2224	732	641	91
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	32.8	34.8	34.8	32.8	34.8	34.8	7.3	29.6	62.4	13.8	36.1	36.1
Effective Green, g (s)	33.0	36.1	36.1	33.0	36.1	36.1	7.5	30.9	63.9	14.0	37.4	37.4
Actuated g/C Ratio	0.25	0.28	0.28	0.25	0.28	0.28	0.06	0.24	0.49	0.11	0.29	0.29
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	871	1412	440	1267	1412	440	102	1209	1456	537	1463	455
v/s Ratio Prot	0.34	c0.39		0.17	0.22		0.02	0.29	c0.39	c0.15	0.13	
v/s Ratio Perm			0.04			0.37			0.41			0.06
v/c Ratio	1.32	1.39	0.14	0.68	0.81	1.33	0.43	1.20	1.53	1.36	0.44	0.20
Uniform Delay, d1	48.5	47.0	35.3	43.8	43.7	47.0	59.2	49.6	33.1	58.0	37.7	35.0
Progression Factor	1.00	1.00	1.00	0.95	0.68	0.74	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	152.7	179.7	0.7	1.0	3.3	160.0	2.9	99.0	240.9	175.1	0.2	0.2
Delay (s)	201.2	226.7	36.0	42.5	33.2	194.6	62.1	148.5	273.9	233.1	37.9	35.2
Level of Service	F	F	D	D	C	F	E	F	F	F	D	D
Approach Delay (s)		212.8			78.1			222.5			122.0	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	170.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.47		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	133.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.97	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4583	1335		4497	1274				3303		2682
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4583	1335		4497	1274				3303		2682
Volume (vph)	0	2920	2183	0	1366	262	0	0	0	265	0	986
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3074	2298	0	1438	276	0	0	0	279	0	1038
RTOR Reduction (vph)	0	25	0	0	0	0	0	0	0	0	0	76
Lane Group Flow (vph)	0	3745	1602	0	1438	276	0	0	0	279	0	962
Heavy Vehicles (%)	4%	4%	4%	9%	9%	9%	2%	2%	2%	6%	6%	6%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		84.7	130.0		84.7	130.0				35.4		35.4
Effective Green, g (s)		86.0	130.0		86.0	130.0				36.0		36.0
Actuated g/C Ratio		0.66	1.00		0.66	1.00				0.28		0.28
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		3032	1335		2975	1274				915		743
v/s Ratio Prot		0.82			0.32							
v/s Ratio Perm			c1.20			0.22				0.08		0.36
v/c Ratio		1.24	1.20		0.48	0.22				0.30		1.29
Uniform Delay, d1		22.0	65.0		10.9	0.0				37.1		47.0
Progression Factor		0.74	1.00		0.70	1.00				1.00		1.00
Incremental Delay, d2		106.1	90.7		0.3	0.2				0.2		142.6
Delay (s)		122.3	155.7		8.0	0.2				37.3		189.6
Level of Service		F	F		A	A				D		F
Approach Delay (s)		132.3			6.7			0.0			157.3	
Approach LOS		F			A			A			F	

Intersection Summary			
HCM Average Control Delay	110.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3303	3406			4456	1263	1588	1588	2632			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3303	3406			4456	1263	1588	1588	2632			
Volume (vph)	1100	2085	0	0	1089	378	539	0	1168	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1158	2195	0	0	1146	398	567	0	1229	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	273	0	0	5	0	0	0
Lane Group Flow (vph)	1158	2195	0	0	1146	125	284	283	1224	0	0	0
Heavy Vehicles (%)	6%	6%	6%	10%	10%	10%	8%	8%	8%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	36.8	70.7			30.4	30.4	49.4	49.4	49.4			
Effective Green, g (s)	37.0	72.0			31.0	31.0	50.0	50.0	50.0			
Actuated g/C Ratio	0.28	0.55			0.24	0.24	0.38	0.38	0.38			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	940	1886			1063	301	611	611	1012			
v/s Ratio Prot	0.35	c0.64			0.26		0.18	0.18				
v/s Ratio Perm						0.10			c0.47			
v/c Ratio	1.23	1.16			1.08	0.41	0.46	0.46	1.21			
Uniform Delay, d1	46.5	29.0			49.5	41.8	30.0	30.0	40.0			
Progression Factor	0.79	0.66			0.46	1.69	1.00	1.00	1.00			
Incremental Delay, d2	105.3	74.3			46.2	2.6	0.6	0.6	103.6			
Delay (s)	142.0	93.5			69.0	73.3	30.5	30.5	143.6			
Level of Service	F	F			E	E	C	C	F			
Approach Delay (s)		110.3			70.1			107.9			0.0	
Approach LOS		F			E			F			A	

Intersection Summary			
HCM Average Control Delay	100.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.95		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	4803	1495	1687	4758		3183	1637		1626	3224	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	4803	1495	1687	4758		3183	1637		1626	3224	
Volume (vph)	257	1972	659	160	978	138	303	400	215	188	639	39
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	271	2076	694	168	1029	145	319	421	226	198	673	41
RTOR Reduction (vph)	0	0	214	0	14	0	0	15	0	0	3	0
Lane Group Flow (vph)	271	2076	480	168	1160	0	319	632	0	198	711	0
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	10%	10%	10%	11%	11%	11%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	21.9	47.4	47.4	10.8	36.3		15.7	40.7		12.8	38.5	
Effective Green, g (s)	22.1	48.0	48.0	11.0	36.9		15.9	42.0		13.0	39.1	
Actuated g/C Ratio	0.17	0.37	0.37	0.08	0.28		0.12	0.32		0.10	0.30	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	284	1773	552	143	1351		389	529		163	970	
v/s Ratio Prot	0.16	c0.43		c0.10	0.24		0.10	c0.39		c0.12	0.22	
v/s Ratio Perm			0.32									
v/c Ratio	0.95	1.17	0.87	1.17	0.86		0.82	1.19		1.21	0.73	
Uniform Delay, d1	53.4	41.0	38.1	59.5	44.1		55.7	44.0		58.5	40.8	
Progression Factor	0.91	0.98	0.95	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.9	77.5	1.9	129.9	7.3		12.9	105.1		139.8	2.9	
Delay (s)	56.7	117.8	38.2	189.4	51.3		68.6	149.1		198.3	43.6	
Level of Service	E	F	D	F	D		E	F		F	D	
Approach Delay (s)		94.2			68.6			122.5			77.2	
Approach LOS		F			E			F			E	

Intersection Summary			
HCM Average Control Delay	90.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	104.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	284	59	97	31	163	119	86	2413	18	84	826	305
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	299	62	102	33	172	125	91	2540	19	88	869	321
RTOR Reduction (vph)	0	0	79	0	0	110	0	0	4	0	0	147
Lane Group Flow (vph)	299	62	23	33	172	15	91	2540	15	88	869	174
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	22.0	33.2	33.2	5.4	16.6	16.6	12.2	85.6	85.6	6.8	80.2	80.2
Effective Green, g (s)	22.2	34.5	34.5	5.6	17.9	17.9	12.4	86.9	86.9	7.0	81.5	81.5
Actuated g/C Ratio	0.15	0.23	0.23	0.04	0.12	0.12	0.08	0.58	0.58	0.05	0.54	0.54
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	262	428	364	66	222	333	146	2050	917	83	1923	860
v/s Ratio Prot	c0.17	0.03		0.02	c0.09		0.05	c0.72		c0.05	0.25	
v/s Ratio Perm			0.01			0.01			0.01			0.11
v/c Ratio	1.14	0.14	0.06	0.50	0.77	0.04	0.62	1.24	0.02	1.06	0.45	0.20
Uniform Delay, d1	63.9	46.0	45.1	70.8	64.1	58.5	66.5	31.6	13.4	71.5	20.7	17.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.20	0.44	0.17	1.00	1.00	1.00
Incremental Delay, d2	99.1	0.2	0.1	5.8	15.4	0.1	2.4	108.8	0.0	116.2	0.8	0.5
Delay (s)	163.0	46.2	45.2	76.7	79.5	58.5	82.0	122.9	2.2	187.7	21.5	18.1
Level of Service	F	D	D	E	E	E	F	F	A	F	C	B
Approach Delay (s)		121.4			71.3			120.6			32.1	
Approach LOS		F			E			F			C	

Intersection Summary			
HCM Average Control Delay	93.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	105.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.20	1.00	1.00	0.75	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	373	1863	1583	1390	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	31	16	34	18	234	202	319	2337	10	150	711	92
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	17	36	19	246	213	336	2460	11	158	748	97
RTOR Reduction (vph)	0	0	31	0	0	124	0	0	2	0	0	70
Lane Group Flow (vph)	33	17	5	19	246	89	336	2460	9	158	748	27
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	18.7	18.7	18.7	18.7	18.7	18.7	76.8	102.7	102.7	13.8	39.7	39.7
Effective Green, g (s)	20.0	20.0	20.0	20.0	20.0	20.0	77.0	104.0	104.0	14.0	41.0	41.0
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.51	0.69	0.69	0.09	0.27	0.27
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	50	248	211	185	248	211	909	2454	1098	165	967	433
v/s Ratio Prot		0.01			c0.13		0.19	c0.70		c0.09	0.21	
v/s Ratio Perm	0.09		0.00	0.01		0.06			0.01			0.02
v/c Ratio	0.66	0.07	0.02	0.10	0.99	0.42	0.37	1.00	0.01	0.96	0.77	0.06
Uniform Delay, d1	61.8	56.9	56.5	57.1	64.9	59.7	21.9	23.0	7.1	67.7	50.2	40.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.67	0.24
Incremental Delay, d2	28.1	0.1	0.0	0.2	54.7	1.4	0.3	18.7	0.0	54.3	5.6	0.2
Delay (s)	89.9	57.0	56.5	57.4	119.6	61.1	22.2	41.7	7.1	110.2	39.2	10.0
Level of Service	F	E	E	E	F	E	C	D	A	F	D	A
Approach Delay (s)		69.4			91.0			39.3			47.5	
Approach LOS		E			F			D			D	

Intersection Summary			
HCM Average Control Delay	47.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1335	1863	1583	570	1863	1583
Volume (vph)	322	2464	80	276	872	242	75	167	282	78	52	123
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	339	2594	84	291	918	255	79	176	297	82	55	129
RTOR Reduction (vph)	0	0	16	0	0	89	0	0	179	0	0	112
Lane Group Flow (vph)	339	2594	68	291	918	166	79	176	118	82	55	17
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	32.2	95.4	95.4	21.8	85.0	85.0	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	32.4	96.7	96.7	22.0	86.3	86.3	19.3	19.3	19.3	19.3	19.3	19.3
Actuated g/C Ratio	0.22	0.64	0.64	0.15	0.58	0.58	0.13	0.13	0.13	0.13	0.13	0.13
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	382	2281	1021	260	2036	911	172	240	204	73	240	204
v/s Ratio Prot	0.19	c0.73		c0.16	0.26			0.09			0.03	
v/s Ratio Perm			0.04			0.10	0.06		0.07	c0.14		0.01
v/c Ratio	0.89	1.14	0.07	1.12	0.45	0.18	0.46	0.73	0.58	1.12	0.23	0.08
Uniform Delay, d1	57.0	26.6	9.9	64.0	18.3	15.1	60.5	62.9	61.5	65.4	58.7	57.5
Progression Factor	0.97	0.90	0.73	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.6	64.4	0.1	91.7	0.7	0.4	1.9	11.0	4.2	142.8	0.5	0.2
Delay (s)	66.2	88.3	7.3	155.7	19.0	15.5	62.5	73.9	65.7	208.1	59.2	57.7
Level of Service	E	F	A	F	B	B	E	E	E	F	E	E
Approach Delay (s)		83.5			45.6			67.8			104.4	
Approach LOS		F			D			E			F	

Intersection Summary			
HCM Average Control Delay	72.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.27	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	499	3539	3539	1583
Volume (vph)	7	24	37	2859	1009	61
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	7	25	39	3009	1062	64
RTOR Reduction (vph)	0	25	0	0	0	5
Lane Group Flow (vph)	7	0	39	3009	1062	59
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)	2.4	2.4	138.6	138.6	138.6	138.6
Effective Green, g (s)	2.9	2.9	139.1	139.1	139.1	139.1
Actuated g/C Ratio	0.02	0.02	0.93	0.93	0.93	0.93
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	34	31	463	3282	3282	1468
v/s Ratio Prot	c0.00			c0.85	0.30	
v/s Ratio Perm		0.00	0.08			0.04
v/c Ratio	0.21	0.02	0.08	0.92	0.32	0.04
Uniform Delay, d1	72.4	72.1	0.4	2.6	0.6	0.4
Progression Factor	1.00	1.00	1.00	1.00	0.07	0.00
Incremental Delay, d2	3.0	0.2	0.4	5.3	0.2	0.0
Delay (s)	75.4	72.4	0.8	7.9	0.3	0.0
Level of Service	E	E	A	A	A	A
Approach Delay (s)	73.0			7.8	0.3	
Approach LOS	E			A	A	

Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.90						1.00	0.85	1.00	1.00	
Flt Protected		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1398						3312	1482	1612	1696	
Flt Permitted		0.99						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1398						3312	1482	1612	1696	
Volume (vph)	257	5	676	0	0	0	0	461	411	60	494	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	271	5	712	0	0	0	0	485	433	63	520	0
RTOR Reduction (vph)	0	139	0	0	0	0	0	0	310	0	0	0
Lane Group Flow (vph)	0	849	0	0	0	0	0	485	123	63	520	0
Heavy Vehicles (%)	21%	21%	21%	2%	2%	2%	9%	9%	9%	12%	12%	12%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		26.6						16.2	16.2	3.5	23.9	
Effective Green, g (s)		27.2						17.1	17.1	3.7	24.8	
Actuated g/C Ratio		0.45						0.29	0.29	0.06	0.41	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		634						944	422	99	701	
v/s Ratio Prot		c0.61						0.15		0.04	c0.31	
v/s Ratio Perm									0.08			
v/c Ratio		1.34						0.51	0.29	0.64	0.74	
Uniform Delay, d1		16.4						18.0	16.7	27.5	14.9	
Progression Factor		1.00						1.00	1.00	0.76	0.65	
Incremental Delay, d2		162.8						2.0	1.8	1.2	0.7	
Delay (s)		179.2						20.0	18.5	22.2	10.3	
Level of Service		F						B	B	C	B	
Approach Delay (s)		179.2			0.0			19.3			11.6	
Approach LOS		F			A			B			B	

Intersection Summary			
HCM Average Control Delay	81.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.92		1.00	1.00			0.91	
Flt Protected					0.98		0.95	1.00			1.00	
Satd. Flow (prot)					1500		1656	3312			1590	
Flt Permitted					0.98		0.95	1.00			1.00	
Satd. Flow (perm)					1500		1656	3312			1590	
Volume (vph)	0	0	0	215	3	348	207	511	0	0	339	630
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	226	3	366	218	538	0	0	357	663
RTOR Reduction (vph)	0	0	0	0	96	0	0	0	0	0	111	0
Lane Group Flow (vph)	0	0	0	0	499	0	218	538	0	0	909	0
Heavy Vehicles (%)	2%	2%	2%	14%	14%	14%	9%	9%	9%	9%	9%	9%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					14.4		7.8	36.1			24.1	
Effective Green, g (s)					15.0		8.0	37.0			25.0	
Actuated g/C Ratio					0.25		0.13	0.62			0.42	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					375		221	2042			663	
v/s Ratio Prot					c0.33		c0.13	0.16			c0.57	
v/s Ratio Perm												
v/c Ratio					1.33		0.99	0.26			1.37	
Uniform Delay, d1					22.5		25.9	5.3			17.5	
Progression Factor					1.00		0.93	0.50			1.00	
Incremental Delay, d2					166.1		44.0	0.2			176.2	
Delay (s)					188.6		68.1	2.8			193.7	
Level of Service					F		E	A			F	
Approach Delay (s)		0.0			188.6			21.6			193.7	
Approach LOS		A			F			C			F	

Intersection Summary			
HCM Average Control Delay	137.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	111.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		1.00						1.00	0.85	1.00	1.00	
Flt Protected		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770						1863	1583	1770	1863	
Flt Permitted		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770						1863	1583	1770	1863	
Volume (vph)	1269	0	32	0	0	0	0	231	296	650	496	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1336	0	34	0	0	0	0	243	312	684	522	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	268	0	0	0
Lane Group Flow (vph)	0	1370	0	0	0	0	0	243	44	684	522	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		78.4						19.7	19.7	37.8	61.7	
Effective Green, g (s)		79.0						21.0	21.0	38.0	63.0	
Actuated g/C Ratio		0.53						0.14	0.14	0.25	0.42	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		932						261	222	448	782	
v/s Ratio Prot		c0.77						c0.13		c0.39	0.28	
v/s Ratio Perm									0.03			
v/c Ratio		1.47						0.93	0.20	1.53	0.67	
Uniform Delay, d1		35.5						63.8	57.0	56.0	35.1	
Progression Factor		1.00						1.00	1.00	0.67	0.94	
Incremental Delay, d2		217.1						40.4	2.0	238.1	0.4	
Delay (s)		252.6						104.2	59.0	275.4	33.3	
Level of Service		F						F	E	F	C	
Approach Delay (s)		252.6			0.0			78.8			170.6	
Approach LOS		F			A			E			F	

Intersection Summary			
HCM Average Control Delay	190.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.40		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	245.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.90		1.00	1.00		1.00	0.92		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3122		1770	3531		1736	3177		1671	3110	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3122		1770	3531		1736	3177		1671	3110	
Volume (vph)	648	632	1281	1019	697	11	5	1023	1324	5	399	346
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	682	665	1348	1073	734	12	5	1077	1394	5	420	364
RTOR Reduction (vph)	0	127	0	0	1	0	0	150	0	0	100	0
Lane Group Flow (vph)	682	1886	0	1073	745	0	5	2321	0	5	684	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	8%	8%	8%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	23.8	41.7		35.8	53.7		0.8	52.7		0.8	52.7	
Effective Green, g (s)	24.0	43.0		36.0	55.0		1.0	54.0		1.0	54.0	
Actuated g/C Ratio	0.16	0.29		0.24	0.37		0.01	0.36		0.01	0.36	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	278	895		425	1295		12	1144		11	1120	
v/s Ratio Prot	0.39	c0.60		c0.61	0.21		0.00	c0.73		c0.00	0.22	
v/s Ratio Perm												
v/c Ratio	2.45	2.36dr		2.52	0.58		0.42	1.89dr		0.45	0.61	
Uniform Delay, d1	63.0	53.5		57.0	38.1		74.2	48.0		74.2	39.4	
Progression Factor	1.00	1.00		1.00	1.00		0.97	0.98		1.00	1.00	
Incremental Delay, d2	664.7	502.1		693.1	0.6		2.1	463.1		27.0	2.5	
Delay (s)	727.7	555.6		750.1	38.8		73.8	510.1		101.3	41.9	
Level of Service	F	F		F	D		E	F		F	D	
Approach Delay (s)		599.1			458.3			509.2			42.2	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM Average Control Delay	481.1	HCM Level of Service	F
HCM Volume to Capacity ratio	2.18		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	196.1%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.88		1.00	1.00			1.00	0.85
Flt Protected					0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1633		1770	1863			1863	1583
Flt Permitted					0.99		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1633		1770	1863			1863	1583
Volume (vph)	0	0	0	147	0	998	140	1360	0	0	999	1523
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	155	0	1051	147	1432	0	0	1052	1603
RTOR Reduction (vph)	0	0	0	0	11	0	0	0	0	0	0	402
Lane Group Flow (vph)	0	0	0	0	1195	0	147	1432	0	0	1052	1201
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					67.4		9.8	72.7			58.7	58.7
Effective Green, g (s)					68.0		10.0	74.0			60.0	60.0
Actuated g/C Ratio					0.45		0.07	0.49			0.40	0.40
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					740		118	919			745	633
v/s Ratio Prot					c0.73		0.08	c0.77			0.56	
v/s Ratio Perm												c0.76
v/c Ratio					1.61		1.25	1.56			1.41	1.90
Uniform Delay, d1					41.0		70.0	38.0			45.0	45.0
Progression Factor					1.00		1.22	0.38			0.58	0.95
Incremental Delay, d2					282.6		117.2	251.7			186.2	404.3
Delay (s)					323.6		202.3	266.1			212.5	447.2
Level of Service					F		F	F			F	F
Approach Delay (s)		0.0			323.6			260.1			354.2	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	320.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.75		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	245.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3530	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3530	
Volume (vph)	5	5	5	283	5	5	5	849	589	5	275	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	5	298	5	5	5	894	620	5	289	5
RTOR Reduction (vph)	0	0	5	0	0	4	0	0	205	0	1	0
Lane Group Flow (vph)	5	5	0	298	5	1	5	894	415	5	293	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	0.8	1.3	1.3	12.8	13.3	13.3	1.3	58.3	58.3	0.8	57.8	
Effective Green, g (s)	1.0	1.5	1.5	13.0	13.5	13.5	1.5	58.5	58.5	1.0	58.0	
Actuated g/C Ratio	0.01	0.02	0.02	0.14	0.15	0.15	0.02	0.65	0.65	0.01	0.64	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	20	31	26	496	279	237	30	1211	1029	20	2275	
v/s Ratio Prot	0.00	c0.00		c0.09	0.00		0.00	c0.48		0.00	c0.08	
v/s Ratio Perm			0.00			0.00			0.26			
v/c Ratio	0.25	0.16	0.00	0.60	0.02	0.00	0.17	0.74	0.40	0.25	0.13	
Uniform Delay, d1	44.1	43.6	43.5	36.1	32.6	32.5	43.6	10.6	7.5	44.1	6.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.78	1.21	
Incremental Delay, d2	6.5	2.4	0.0	2.1	0.0	0.0	2.6	4.1	1.2	6.4	0.1	
Delay (s)	50.6	46.1	43.6	38.1	32.6	32.5	46.3	14.7	8.6	41.0	7.6	
Level of Service	D	D	D	D	C	C	D	B	A	D	A	
Approach Delay (s)		46.7			37.9			12.3			8.2	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	5	5	275	5	5	849
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	289	5	5	894
RTOR Reduction (vph)	0	5	0	0	0	134
Lane Group Flow (vph)	5	0	289	5	5	760
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	1.3	1.3	74.8	80.3	1.3	76.1
Effective Green, g (s)	1.5	1.5	75.0	80.5	1.5	76.5
Actuated g/C Ratio	0.02	0.02	0.83	0.89	0.02	0.85
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	31	26	1475	1666	30	1416
v/s Ratio Prot	c0.00		0.16	0.00	0.00	c0.45
v/s Ratio Perm		0.00				0.03
v/c Ratio	0.16	0.00	0.20	0.00	0.17	0.54
Uniform Delay, d1	43.6	43.5	1.5	0.5	43.6	1.9
Progression Factor	1.00	1.00	0.47	0.39	0.72	19.56
Incremental Delay, d2	2.4	0.0	0.3	0.0	2.0	0.3
Delay (s)	46.1	43.6	1.0	0.2	33.5	36.7
Level of Service	D	D	A	A	C	D
Approach Delay (s)	44.8			1.0	36.7	
Approach LOS	D			A	D	

Intersection Summary			
HCM Average Control Delay	28.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	199	691	219	295	136	56
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	209	727	231	311	143	59
RTOR Reduction (vph)	0	0	0	137	0	51
Lane Group Flow (vph)	209	727	231	174	143	8
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	15.2	69.6	50.2	50.2	12.0	12.0
Effective Green, g (s)	15.4	69.8	50.4	50.4	12.2	12.2
Actuated g/C Ratio	0.17	0.78	0.56	0.56	0.14	0.14
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	303	2745	1982	886	240	215
v/s Ratio Prot	c0.12	c0.21	0.07		c0.08	
v/s Ratio Perm				0.11		0.01
v/c Ratio	0.69	0.26	0.12	0.20	0.60	0.04
Uniform Delay, d1	35.1	2.9	9.3	9.8	36.6	33.8
Progression Factor	0.83	0.23	0.39	0.09	1.00	1.00
Incremental Delay, d2	5.5	0.2	0.1	0.5	3.9	0.1
Delay (s)	34.7	0.9	3.7	1.4	40.5	33.9
Level of Service	C	A	A	A	D	C
Approach Delay (s)		8.4	2.4		38.6	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	69	1247	712	189	84	14
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	73	1313	749	199	88	15
RTOR Reduction (vph)	0	0	0	63	0	14
Lane Group Flow (vph)	73	1313	749	136	88	1
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	7.7	73.4	61.5	61.5	8.2	8.2
Effective Green, g (s)	7.9	73.6	61.7	61.7	8.4	8.4
Actuated g/C Ratio	0.09	0.82	0.69	0.69	0.09	0.09
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	155	2894	2426	1085	165	148
v/s Ratio Prot	0.04	c0.37	0.21			
v/s Ratio Perm				0.09	c0.05	0.00
v/c Ratio	0.47	0.45	0.31	0.13	0.53	0.01
Uniform Delay, d1	39.1	2.4	5.6	4.9	38.9	37.0
Progression Factor	1.04	0.84	0.16	0.14	1.00	1.00
Incremental Delay, d2	2.2	0.5	0.3	0.2	3.3	0.0
Delay (s)	42.9	2.5	1.2	0.9	42.2	37.1
Level of Service	D	A	A	A	D	D
Approach Delay (s)		4.6	1.2		41.5	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3494		1770	3536		1770	1723		1770	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.62	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3494		1770	3536		1153	1723		1399	1597	
Volume (vph)	216	1221	114	5	837	5	64	5	5	5	5	93
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	227	1285	120	5	881	5	67	5	5	5	5	98
RTOR Reduction (vph)	0	4	0	0	0	0	0	5	0	0	88	0
Lane Group Flow (vph)	227	1401	0	5	886	0	67	5	0	5	15	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	15.3	67.4		1.3	53.4		8.7	8.7		8.7	8.7	
Effective Green, g (s)	15.5	67.6		1.5	53.6		8.9	8.9		8.9	8.9	
Actuated g/C Ratio	0.17	0.75		0.02	0.60		0.10	0.10		0.10	0.10	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	305	2624		30	2106		114	170		138	158	
v/s Ratio Prot	c0.13	c0.40		0.00	0.25			0.00			0.01	
v/s Ratio Perm							c0.06			0.00		
v/c Ratio	0.74	0.53		0.17	0.42		0.59	0.03		0.04	0.09	
Uniform Delay, d1	35.4	4.7		43.6	9.8		38.8	36.7		36.7	36.9	
Progression Factor	1.00	0.70		1.02	0.48		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.9	0.7		2.6	0.6		7.5	0.1		0.1	0.3	
Delay (s)	44.1	4.0		47.1	5.3		46.3	36.7		36.8	37.1	
Level of Service	D	A		D	A		D	D		D	D	
Approach Delay (s)		9.6			5.5			45.1			37.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3325		1770	3533		1770	1596		1770	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.67	1.00		0.66	1.00	
Satd. Flow (perm)	1770	3325		1770	3533		1252	1596		1229	1597	
Volume (vph)	217	362	245	62	397	5	161	5	99	5	5	94
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	228	381	258	65	418	5	169	5	104	5	5	99
RTOR Reduction (vph)	0	90	0	0	1	0	0	84	0	0	80	0
Lane Group Flow (vph)	228	549	0	65	422	0	169	25	0	5	24	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	18.4	52.7		7.5	41.8		17.2	17.2		17.2	17.2	
Effective Green, g (s)	18.6	52.9		7.7	42.0		17.4	17.4		17.4	17.4	
Actuated g/C Ratio	0.21	0.59		0.09	0.47		0.19	0.19		0.19	0.19	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	366	1954		151	1649		242	309		238	309	
v/s Ratio Prot	c0.13	c0.17		c0.04	0.12			0.02			0.02	
v/s Ratio Perm							c0.14			0.00		
v/c Ratio	0.62	0.28		0.43	0.26		0.70	0.08		0.02	0.08	
Uniform Delay, d1	32.5	9.2		39.1	14.5		33.9	29.7		29.4	29.7	
Progression Factor	0.80	0.65		0.92	1.41		0.90	2.29		1.00	1.00	
Incremental Delay, d2	2.9	0.3		1.8	0.3		5.8	0.1		0.0	0.1	
Delay (s)	28.9	6.3		37.9	20.8		36.2	68.1		29.4	29.8	
Level of Service	C	A		D	C		D	E		C	C	
Approach Delay (s)		12.2			23.1			48.7			29.8	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM Average Control Delay	22.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.85	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3407		1770	1506	1504	1770	1594	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.69	1.00	1.00	0.16	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3407		1287	1506	1504	304	1594	
Volume (vph)	225	365	87	105	318	105	140	6	1309	145	4	93
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	237	384	92	111	335	111	147	6	1378	153	4	98
RTOR Reduction (vph)	0	0	77	0	36	0	0	217	217	0	48	0
Lane Group Flow (vph)	237	384	15	111	410	0	147	478	472	153	54	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	12.9	14.7	14.7	17.3	19.1		45.4	45.4	45.4	45.4	45.4	
Effective Green, g (s)	13.1	14.9	14.9	17.5	19.3		45.6	45.6	45.6	45.6	45.6	
Actuated g/C Ratio	0.15	0.17	0.17	0.19	0.21		0.51	0.51	0.51	0.51	0.51	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	258	586	262	668	731		652	763	762	154	808	
v/s Ratio Prot	c0.13	0.11		0.03	c0.12			0.32			0.03	
v/s Ratio Perm			0.01				0.11		0.31	c0.50		
v/c Ratio	0.92	0.66	0.06	0.17	0.56		0.23	0.63	0.62	0.99	0.07	
Uniform Delay, d1	37.9	35.1	31.6	30.2	31.6		12.4	16.0	16.0	22.1	11.3	
Progression Factor	0.90	0.86	0.75	0.85	0.84		0.61	0.38	0.38	1.00	1.00	
Incremental Delay, d2	34.4	2.6	0.1	0.5	3.1		0.2	1.4	1.3	70.3	0.0	
Delay (s)	68.5	32.8	23.7	26.0	29.4		7.7	7.5	7.4	92.3	11.4	
Level of Service	E	C	C	C	C		A	A	A	F	B	
Approach Delay (s)		43.5			28.7			7.4			59.9	
Approach LOS		D			C			A			E	

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3534		1770	1508	1504	1770	1661	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.75	1.00	1.00	0.36	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3534		1389	1508	1504	665	1661	
Volume (vph)	26	1734	61	415	449	5	69	5	585	7	5	12
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	27	1825	64	437	473	5	73	5	616	7	5	13
RTOR Reduction (vph)	0	0	12	0	1	0	0	224	224	0	11	0
Lane Group Flow (vph)	27	1825	52	437	477	0	73	89	84	7	7	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	2.6	52.5	52.5	13.9	63.8		11.0	11.0	11.0	11.0	11.0	
Effective Green, g (s)	2.8	52.7	52.7	14.1	64.0		11.2	11.2	11.2	11.2	11.2	
Actuated g/C Ratio	0.03	0.59	0.59	0.16	0.71		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	55	2072	927	538	2513		173	188	187	83	207	
v/s Ratio Prot	0.02	c0.52		c0.13	0.14			c0.06			0.00	
v/s Ratio Perm			0.03				0.05		0.06	0.01		
v/c Ratio	0.49	0.88	0.06	0.81	0.19		0.42	0.47	0.45	0.08	0.03	
Uniform Delay, d1	42.9	16.0	8.0	36.7	4.3		36.4	36.7	36.5	34.9	34.6	
Progression Factor	1.08	0.62	0.38	1.00	1.00		1.00	1.02	1.01	1.00	1.00	
Incremental Delay, d2	4.6	3.3	0.0	12.6	0.2		1.7	1.9	1.7	0.4	0.1	
Delay (s)	51.0	13.3	3.1	49.3	4.5		38.2	39.3	38.8	35.3	34.7	
Level of Service	D	B	A	D	A		D	D	D	D	C	
Approach Delay (s)		13.5			25.9			38.9			34.9	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑		↱
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2269	21	0	866	0	423
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	2388	22	0	912	0	445
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.50		0.50	0.50
vC, conflicting volume			2411		2844	1194
vC1, stage 1 conf vol					2388	
vC2, stage 2 conf vol					456	
vCu, unblocked vol			2826		3698	379
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	51
cM capacity (veh/h)			66		15	902

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	1194	1194	22	456	456	445
Volume Left	0	0	0	0	0	0
Volume Right	0	0	22	0	0	445
cSH	1700	1700	1700	1700	1700	902
Volume to Capacity	0.70	0.70	0.01	0.27	0.27	0.49
Queue Length 95th (ft)	0	0	0	0	0	70
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	12.8
Lane LOS						B
Approach Delay (s)	0.0			0.0		12.8
Approach LOS						B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1628		1770	1608		1770	3498		1770	3536	
Flt Permitted	0.72	1.00		0.74	1.00		0.65	1.00		0.13	1.00	
Satd. Flow (perm)	1342	1628		1373	1608		1202	3498		247	3536	
Volume (vph)	2	5	25	78	5	48	64	1403	117	46	160	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	5	26	82	5	51	67	1477	123	48	168	1
RTOR Reduction (vph)	0	23	0	0	45	0	0	4	0	0	0	0
Lane Group Flow (vph)	2	8	0	82	11	0	67	1596	0	48	169	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.1	9.1		9.1	9.1		72.5	72.5		72.5	72.5	
Effective Green, g (s)	9.3	9.3		9.3	9.3		72.7	72.7		72.7	72.7	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.81	0.81		0.81	0.81	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	139	168		142	166		971	2826		200	2856	
v/s Ratio Prot		0.00			0.01			c0.46			0.05	
v/s Ratio Perm	0.00			c0.06			0.06			0.19		
v/c Ratio	0.01	0.05		0.58	0.07		0.07	0.56		0.24	0.06	
Uniform Delay, d1	36.2	36.4		38.5	36.4		1.8	3.1		2.1	1.7	
Progression Factor	1.00	1.00		1.00	1.00		0.18	0.15		1.06	0.35	
Incremental Delay, d2	0.0	0.1		5.6	0.2		0.1	0.6		2.8	0.0	
Delay (s)	36.3	36.5		44.1	36.6		0.4	1.1		5.0	0.6	
Level of Service	D	D		D	D		A	A		A	A	
Approach Delay (s)		36.5			41.0			1.0			1.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	4.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	28	11	5	5	61	194
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	29	12	5	5	64	204
RTOR Reduction (vph)	0	2	0	0	0	37
Lane Group Flow (vph)	29	10	5	5	64	167
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	2.7	76.2	1.2	8.1	73.5	73.5
Effective Green, g (s)	2.9	76.6	1.4	8.3	73.7	73.7
Actuated g/C Ratio	0.03	0.85	0.02	0.09	0.82	0.82
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	114	1418	53	326	1449	1296
v/s Ratio Prot	c0.01	0.01	c0.00	0.00	0.04	
v/s Ratio Perm		0.00				c0.11
v/c Ratio	0.25	0.01	0.09	0.02	0.04	0.13
Uniform Delay, d1	42.5	1.0	43.7	37.1	1.5	1.7
Progression Factor	1.00	1.00	1.28	1.27	1.11	6.93
Incremental Delay, d2	1.2	0.0	0.8	0.0	0.1	0.2
Delay (s)	43.7	1.0	56.6	47.3	1.8	11.6
Level of Service	D	A	E	D	A	B
Approach Delay (s)	31.2			51.9	9.3	
Approach LOS	C			D	A	

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	22.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.90		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1683		1770	1855		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1683		1770	1855		1770	1863	1583
Volume (vph)	184	30	8	2	5	9	5	419	11	7	147	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	194	32	8	2	5	9	5	441	12	7	155	5
RTOR Reduction (vph)	0	0	4	0	6	0	0	1	0	0	0	3
Lane Group Flow (vph)	194	32	4	2	8	0	5	452	0	7	155	2
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	15.3	40.4	40.4	3.2	28.3		1.3	28.2		1.4	28.3	28.3
Effective Green, g (s)	15.5	40.6	40.6	3.4	28.5		1.5	28.4		1.6	28.5	28.5
Actuated g/C Ratio	0.17	0.45	0.45	0.04	0.32		0.02	0.32		0.02	0.32	0.32
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	305	840	714	67	533		30	585		31	590	501
v/s Ratio Prot	c0.11	c0.02		c0.00	0.00		0.00	c0.24		0.00	c0.08	
v/s Ratio Perm			0.00									0.00
v/c Ratio	0.64	0.04	0.01	0.03	0.01		0.17	0.77		0.23	0.26	0.00
Uniform Delay, d1	34.6	13.8	13.6	41.7	21.1		43.6	27.9		43.6	22.9	21.0
Progression Factor	0.56	0.58	0.45	0.76	0.75		1.36	0.23		1.02	0.88	0.74
Incremental Delay, d2	4.3	0.1	0.0	0.2	0.1		1.5	3.6		3.6	0.2	0.0
Delay (s)	23.7	8.1	6.1	31.8	15.8		60.7	10.0		47.9	20.4	15.6
Level of Service	C	A	A	C	B		E	A		D	C	B
Approach Delay (s)		21.0			17.8			10.5			21.4	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1653		1770	3513		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1653		1770	3513		1770	3539	1583
Volume (vph)	22	16	12	30	1	3	9	1789	94	2	400	2
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	23	17	13	32	1	3	9	1883	99	2	421	2
RTOR Reduction (vph)	0	0	12	0	3	0	0	3	0	0	0	1
Lane Group Flow (vph)	23	17	1	32	1	0	9	1980	0	2	421	1
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	4.6	3.8	3.8	3.8	3.0		1.4	64.8		0.8	64.2	64.2
Effective Green, g (s)	4.8	4.0	4.0	4.0	3.2		1.6	65.0		1.0	64.4	64.4
Actuated g/C Ratio	0.05	0.04	0.04	0.04	0.04		0.02	0.72		0.01	0.72	0.72
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	94	83	70	79	59		31	2537		20	2532	1133
v/s Ratio Prot	0.01	c0.01		c0.02	0.00		0.01	c0.56		0.00	c0.12	
v/s Ratio Perm			0.00									0.00
v/c Ratio	0.24	0.20	0.01	0.41	0.02		0.29	0.78		0.10	0.17	0.00
Uniform Delay, d1	40.9	41.5	41.1	41.8	41.9		43.6	8.0		44.1	4.1	3.6
Progression Factor	0.51	0.57	0.58	1.00	1.00		1.10	0.57		0.99	1.01	0.99
Incremental Delay, d2	1.3	1.2	0.0	3.4	0.1		4.4	2.1		2.2	0.1	0.0
Delay (s)	22.2	24.8	23.9	45.2	42.0		52.4	6.6		46.0	4.3	3.6
Level of Service	C	C	C	D	D		D	A		D	A	A
Approach Delay (s)		23.4			44.9			6.9			4.5	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	41	2	68	31	2	162	32	11	7	6	2	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	43	2	72	33	2	171	34	12	7	6	2	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	173			74			198	362	38	254	313	87
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	173			74			198	362	38	254	313	87
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			95	98	99	99	100	99
cM capacity (veh/h)	1404			1526			725	536	1034	656	571	971

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	43	74	33	173	53	14
Volume Left	43	0	33	0	34	6
Volume Right	0	72	0	171	7	5
cSH	1404	1700	1526	1700	700	730
Volume to Capacity	0.03	0.04	0.02	0.10	0.08	0.02
Queue Length 95th (ft)	2	0	2	0	6	1
Control Delay (s)	7.6	0.0	7.4	0.0	10.6	10.0
Lane LOS	A		A		B	B
Approach Delay (s)	2.8		1.2		10.6	10.0
Approach LOS					B	B

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	7	4	5	243	18	5	194	1444	43	5	1279	43
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	7	4	5	256	19	5	204	1520	45	5	1346	45
RTOR Reduction (vph)	0	0	5	0	0	4	0	0	16	0	0	19
Lane Group Flow (vph)	7	4	0	256	19	1	204	1520	29	5	1346	26
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	0.8	1.3	1.3	18.7	19.2	19.2	10.4	52.4	52.4	0.8	42.8	42.8
Effective Green, g (s)	1.0	1.5	1.5	18.9	19.4	19.4	10.6	52.6	52.6	1.0	43.0	43.0
Actuated g/C Ratio	0.01	0.02	0.02	0.21	0.22	0.22	0.12	0.58	0.58	0.01	0.48	0.48
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	20	31	26	372	402	341	404	2068	925	20	1691	756
v/s Ratio Prot	c0.00	0.00		c0.14	0.01		0.06	c0.43		0.00	c0.38	
v/s Ratio Perm			0.00			0.00			0.02			0.02
v/c Ratio	0.35	0.13	0.00	0.69	0.05	0.00	0.50	0.74	0.03	0.25	0.80	0.03
Uniform Delay, d1	44.2	43.6	43.5	32.8	28.0	27.7	37.2	13.6	7.9	44.1	19.8	12.5
Progression Factor	0.96	0.98	1.03	1.00	1.00	1.00	1.00	1.00	1.00	0.55	0.39	0.13
Incremental Delay, d2	10.3	1.9	0.0	5.2	0.0	0.0	1.0	2.4	0.1	5.5	3.4	0.1
Delay (s)	52.7	44.4	44.7	38.1	28.0	27.7	38.2	16.0	8.0	29.9	11.1	1.7
Level of Service	D	D	D	D	C	C	D	B	A	C	B	A
Approach Delay (s)		48.1			37.2			18.4			10.8	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5069		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	5069		3433	5085	1583	1405	1863	1583	1388	1863	1583
Volume (vph)	447	1027	22	63	1013	38	128	18	401	12	5	179
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	471	1081	23	66	1066	40	135	19	422	13	5	188
RTOR Reduction (vph)	0	3	0	0	0	25	0	0	140	0	0	148
Lane Group Flow (vph)	471	1101	0	66	1066	15	135	19	282	13	5	40
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	26.4	41.9		16.5	32.0	32.0	19.0	19.0	19.0	19.0	19.0	19.0
Effective Green, g (s)	26.6	42.1		16.7	32.2	32.2	19.2	19.2	19.2	19.2	19.2	19.2
Actuated g/C Ratio	0.30	0.47		0.19	0.36	0.36	0.21	0.21	0.21	0.21	0.21	0.21
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	523	2371		637	1819	566	300	397	338	296	397	338
v/s Ratio Prot	c0.27	0.22		0.02	c0.21			0.01			0.00	
v/s Ratio Perm						0.01	0.10		c0.18	0.01		0.03
v/c Ratio	0.90	0.46		0.10	0.59	0.03	0.45	0.05	0.83	0.04	0.01	0.12
Uniform Delay, d1	30.4	16.3		30.4	23.5	18.7	30.8	28.1	33.9	28.1	27.9	28.6
Progression Factor	0.71	0.57		0.78	0.81	0.89	1.00	1.00	1.00	1.25	1.24	4.80
Incremental Delay, d2	15.2	0.5		0.1	1.3	0.1	1.1	0.1	16.1	0.1	0.0	0.2
Delay (s)	36.8	9.7		23.8	20.3	16.8	31.9	28.2	49.9	35.1	34.7	137.4
Level of Service	D	A		C	C	B	C	C	D	D	C	F
Approach Delay (s)		17.8			20.3			45.0			128.4	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM Average Control Delay	29.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

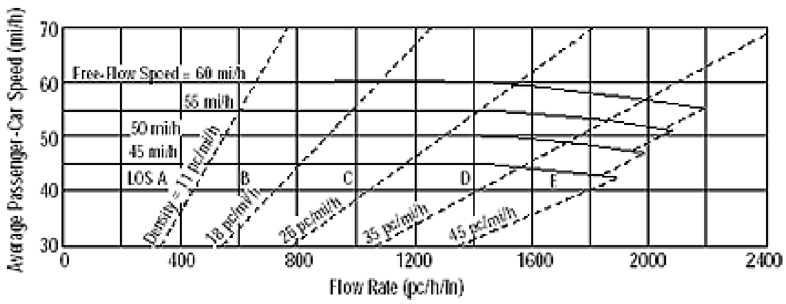
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5066		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5066		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	880	1142	29	206	679	231	20	260	1012	53	24	375
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	926	1202	31	217	715	243	21	274	1065	56	25	395
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	48	0	0	129
Lane Group Flow (vph)	926	1230	0	217	715	243	21	274	1017	56	25	266
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	27.7	27.0		23.4	22.7	90.0	6.3	16.7	40.1	6.1	16.5	44.2
Effective Green, g (s)	27.9	27.2		23.6	22.9	90.0	6.5	16.9	40.5	6.3	16.7	44.6
Actuated g/C Ratio	0.31	0.30		0.26	0.25	1.00	0.07	0.19	0.45	0.07	0.19	0.50
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1064	1531		900	1294	1583	128	350	1378	124	346	1381
v/s Ratio Prot	c0.27	0.24		0.06	0.14		0.01	0.15	c0.19	c0.03	0.01	0.06
v/s Ratio Perm						c0.15			0.17			0.04
v/c Ratio	0.87	0.80		0.24	0.55	0.15	0.16	0.78	0.74	0.45	0.07	0.19
Uniform Delay, d1	29.3	28.9		26.1	29.1	0.0	39.2	34.8	20.4	40.2	30.3	12.7
Progression Factor	0.71	0.69		1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.03	0.90
Incremental Delay, d2	7.4	4.3		0.1	1.7	0.2	0.6	10.9	2.1	2.6	0.1	0.1
Delay (s)	28.1	24.3		26.3	30.8	0.2	39.8	45.7	22.5	46.8	31.2	11.4
Level of Service	C	C		C	C	A	D	D	C	D	C	B
Approach Delay (s)		25.9			23.6			27.4			16.6	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	25.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5081		1770	5042		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.75	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1770	5081		1770	5042		1405	1863	1583	1203	1863	1583
Volume (vph)	94	2248	12	73	911	55	44	126	688	15	5	19
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	99	2366	13	77	959	58	46	133	724	16	5	20
RTOR Reduction (vph)	0	1	0	0	5	0	0	0	65	0	0	12
Lane Group Flow (vph)	99	2378	0	77	1012	0	46	133	659	16	5	8
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	11.1	55.1		5.5	49.5		46.8	46.8	46.8	46.8	46.8	46.8
Effective Green, g (s)	11.3	55.3		5.7	49.7		47.0	47.0	47.0	47.0	47.0	47.0
Actuated g/C Ratio	0.09	0.46		0.05	0.41		0.39	0.39	0.39	0.39	0.39	0.39
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	167	2341		84	2088		550	730	620	471	730	620
v/s Ratio Prot	0.06	c0.47		c0.04	0.20			0.07			0.00	
v/s Ratio Perm							0.03		c0.42	0.01		0.00
v/c Ratio	0.59	1.02		0.92	0.48		0.08	0.18	1.06	0.03	0.01	0.01
Uniform Delay, d1	52.1	32.4		56.9	25.8		23.0	23.9	36.5	22.5	22.3	22.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	22.7		70.2	0.8		0.1	0.1	54.0	0.0	0.0	0.0
Delay (s)	57.7	55.0		127.1	26.6		23.0	24.0	90.5	22.5	22.3	22.3
Level of Service	E	E		F	C		C	C	F	C	C	C
Approach Delay (s)		55.1			33.6			77.2			22.4	
Approach LOS		E			C			E			C	

Intersection Summary			
HCM Average Control Delay	54.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	224	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	0
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.998

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	118
Speed, S (mi/h)	45.0
D (pc/mi/ln)	2.6
LOS	A

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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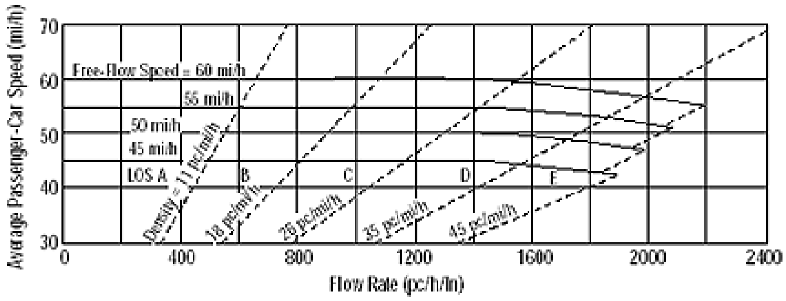
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1301	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.993

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	689
Speed, S (mi/h)	45.0
D (pc/mi/ln)	15.3
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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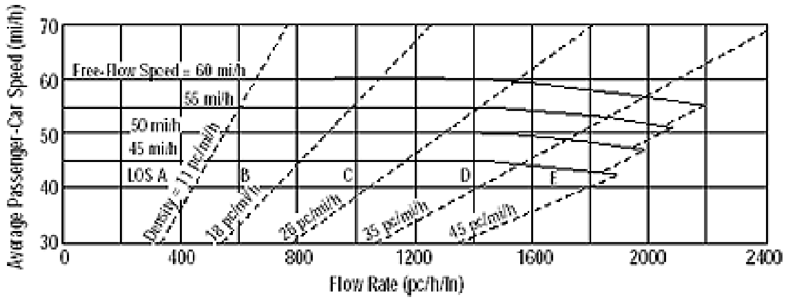
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1497	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	801
Speed, S (mi/h)	45.0
D (pc/mi/ln)	17.8
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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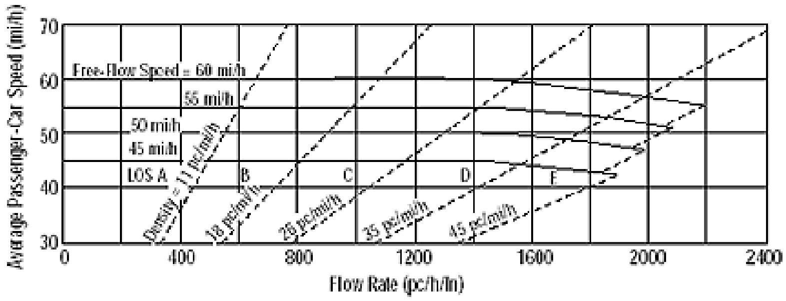
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	613	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	328
Speed, S (mi/h)	45.0
D (pc/mi/ln)	7.3
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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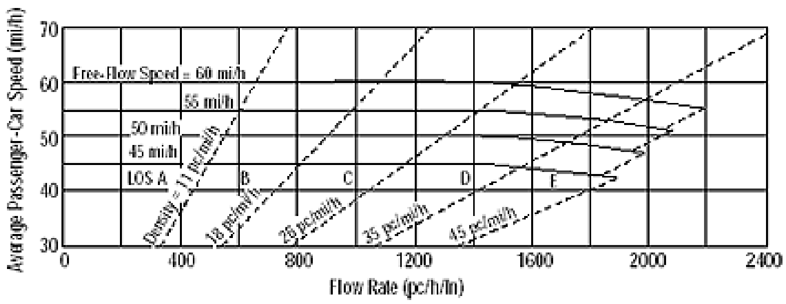
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1528	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	817
Speed, S (mi/h)	45.0
D (pc/mi/ln)	18.2
LOS	C

Design

Design (N)

Required Number of Lanes, N
Flow Rate, v_p (pc/h)
Max Service Flow Rate (pc/h/ln)
Design LOS

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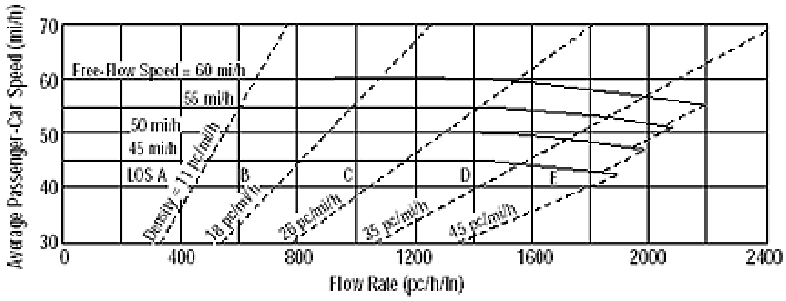
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1688	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	903
Speed, S (mi/h)	45.0
D (pc/mi/ln)	20.1
LOS	C

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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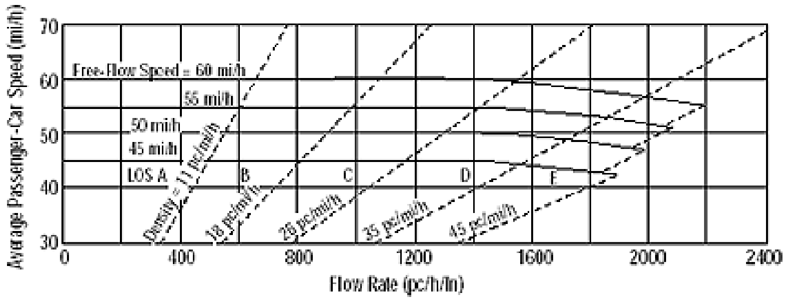
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1880	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	9
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.955

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	1035
Speed, S (mi/h)	45.0
D (pc/mi/ln)	23.0
LOS	C

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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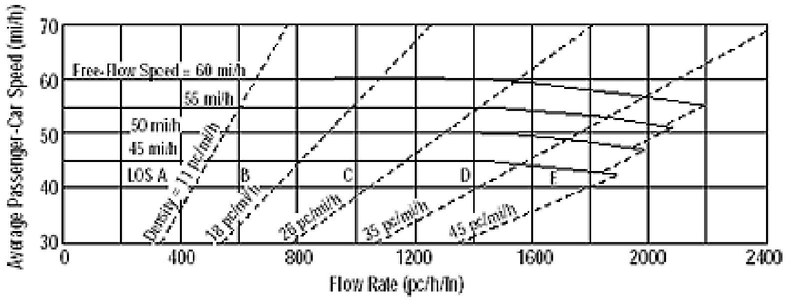
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1690	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	9
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.955

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	931
Speed, S (mi/h)	45.0
D (pc/mi/ln)	20.7
LOS	C

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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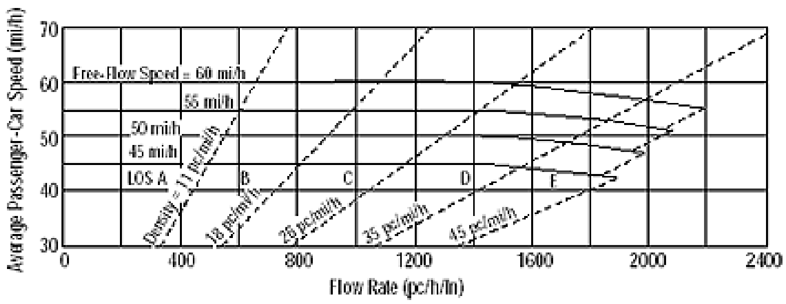
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	143	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.974

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	77
Speed, S (mi/h)	45.0
D (pc/mi/ln)	1.7
LOS	A

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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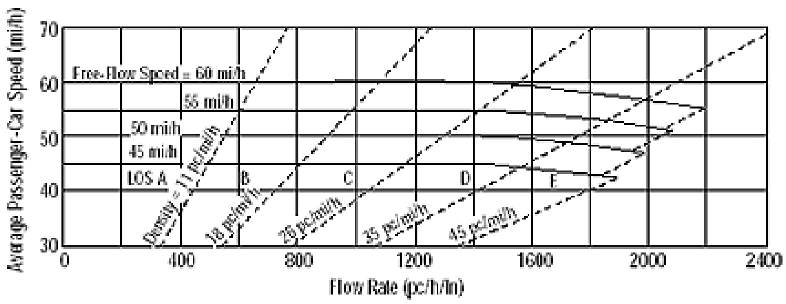
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1641	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.974

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	887
Speed, S (mi/h)	45.0
D (pc/mi/ln)	19.7
LOS	C

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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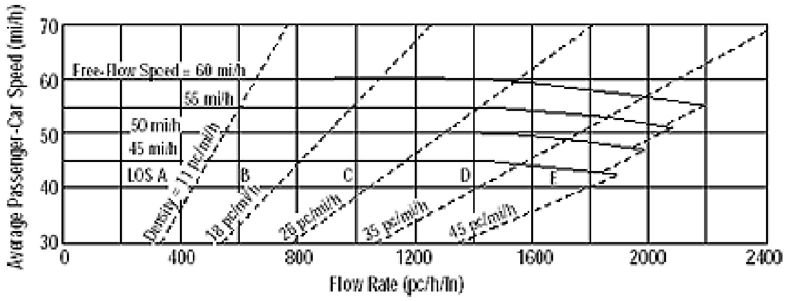
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1553	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	8
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.960

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	851
Speed, S (mi/h)	45.0
D (pc/mi/ln)	18.9
LOS	C

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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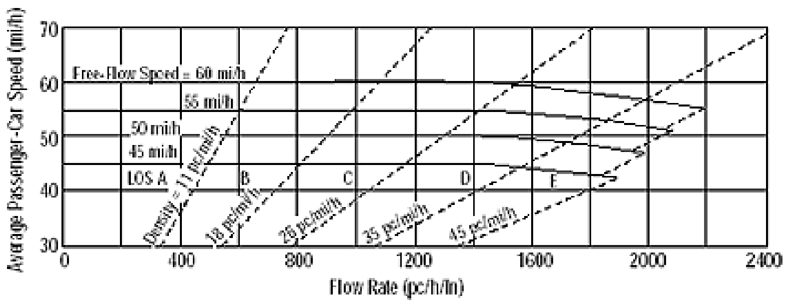
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	656	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	8
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.960

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	359
Speed, S (mi/h)	45.0
D (pc/mi/ln)	8.0
LOS	A

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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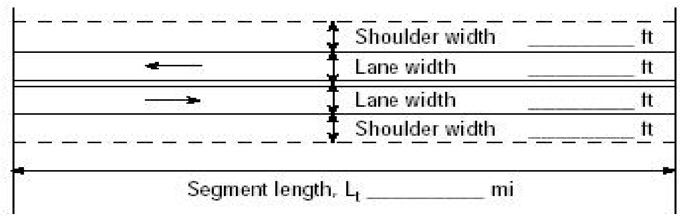
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*MacArthur Dr.*
Agency or Company	*TJKM*	From/To	*Arbor Ave. to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*827* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.95*
No-passing zone	*0*
% Trucks and Buses , P_T	*17* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*0.967*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*900*
v_p * highest directional split proportion[2] (pc/h)	*540*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*60.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.2 mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*55.8 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*48.8*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*0.983*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*885*
v_p * highest directional split proportion[2] (pc/h)	*531*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*54.1*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*0.0*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*54.1*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*B*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.28*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*65*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*248*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*1.3*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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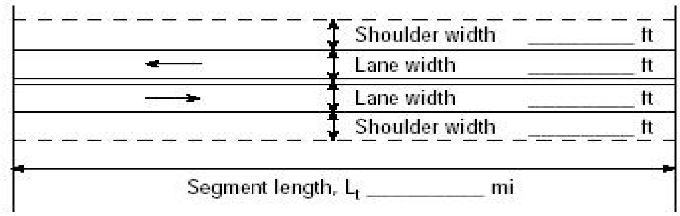
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*MacArthur Dr.*
Agency or Company	*TJKM*	From/To	*Arbor Ave. to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	

Project Description: *River Islands*

Input Data



☐ Class I highway	☑ Class II highway
Terrain	☑ Level ☐ Rolling
Two-way hourly volume	*1464* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.95*
No-passing zone	*0*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.991*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*1555*
v_p * highest directional split proportion[2] (pc/h)	*933*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.2 mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.8 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*28.7*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*1541*
v_p * highest directional split proportion[2] (pc/h)	*925*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*74.2*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*0.0*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*74.2*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*D*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.49*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*116*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*439*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*4.0*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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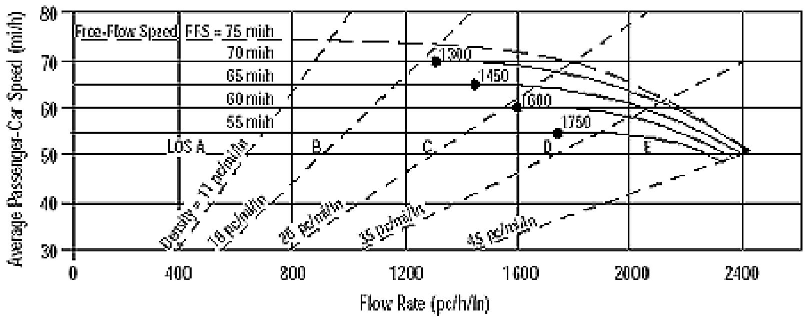
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4388*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1300*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*18.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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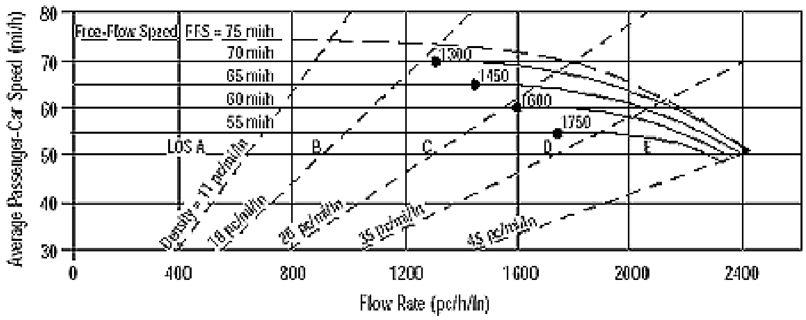
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8955*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2437*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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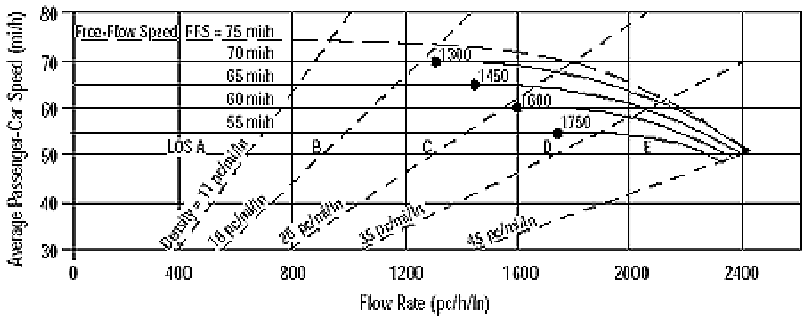
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8605*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2480*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

Factor Location

- E_R - Exhibits23-8, 23-10
- f_{LW} - Exhibit 23-4
- E_T - Exhibits 23-8, 23-10, 23-11
- f_{LC} - Exhibit 23-5
- f_p - Page 23-12
- f_N - Exhibit 23-6
- LOS, S, FFS, v_p - Exhibits 23-2, 23-3
- f_{ID} - Exhibit 23-7

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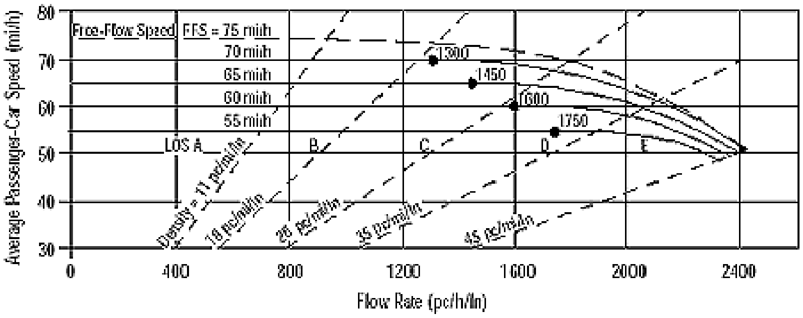
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	TJKM
Date Performed	9/23/2009
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction of Travel	I-5 SB
From/To	North of Louise Ave
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	5943	veh/h	Peak-Hour Factor, PHF	0.98
AADT		veh/day	%Trucks and Buses, P_T	14
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.933

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	4	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1625	pc/h/ln
S	69.3	mi/h
D = v_p / S	23.4	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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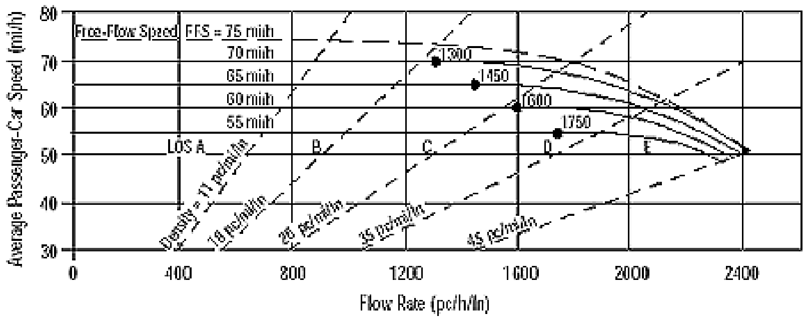

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*SR-120 & Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3994*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1183*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*16.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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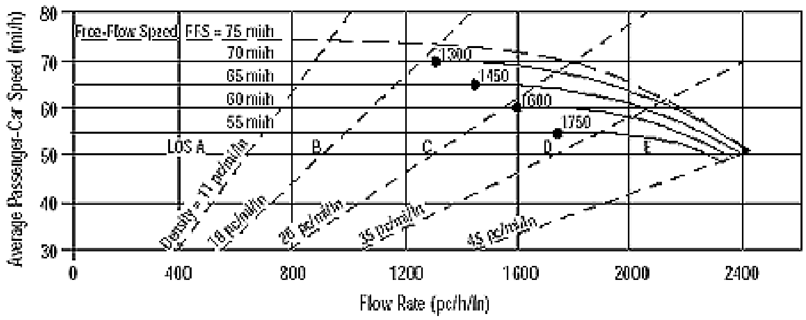
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*Louise Ave & SR-120*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7735*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2105*	pc/h/ln
S	*62.6*	mi/h
D = v_p / S	*33.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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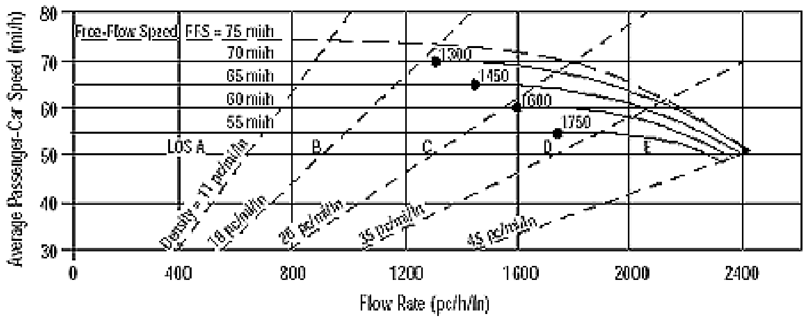
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*Louise Ave & SR-120*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7705*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2220*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*59.5*	mi/h	S	mi/h
D = v_p / S	*37.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*E*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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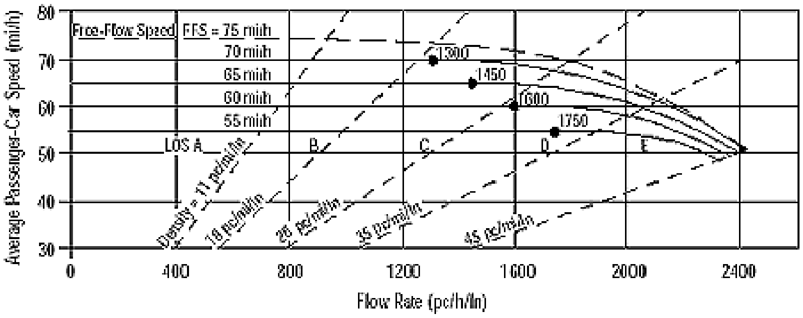
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*Louise Ave & SR-120*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5645*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1544*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*69.7*	mi/h	S	mi/h
D = v_p / S	*22.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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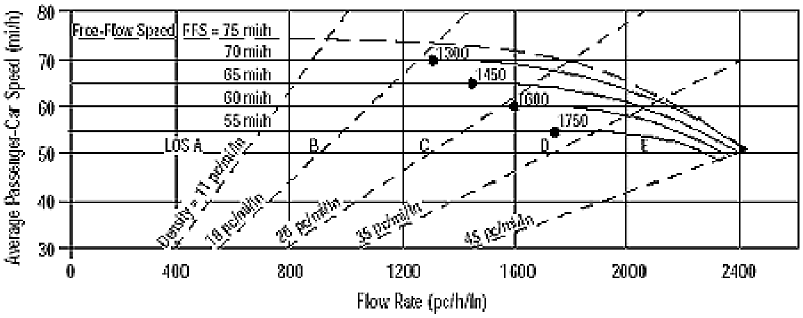
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	TJKM
Date Performed	9/23/2009
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction of Travel	I-5 NB
From/To	SR-120 & Hook Ramps
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	5427	veh/h	Peak-Hour Factor, PHF	0.93
AADT		veh/day	%Trucks and Buses, P_T	20
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.907

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	6	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1072	pc/h/ln
S	70.0	mi/h
D = v_p / S	15.3	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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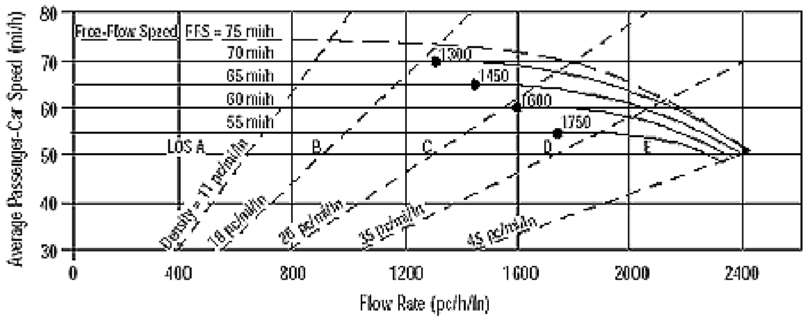
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	TJKM
Date Performed	9/23/2009
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction of Travel	I-5 NB
From/To	SR-120 & Hook Ramps
Jurisdiction	Lathrop
Analysis Year	2031 No Proj

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	14131	veh/h	Peak-Hour Factor, PHF	0.98
AADT		veh/day	%Trucks and Buses, P_T	13
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.937

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	6	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	2564	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	F	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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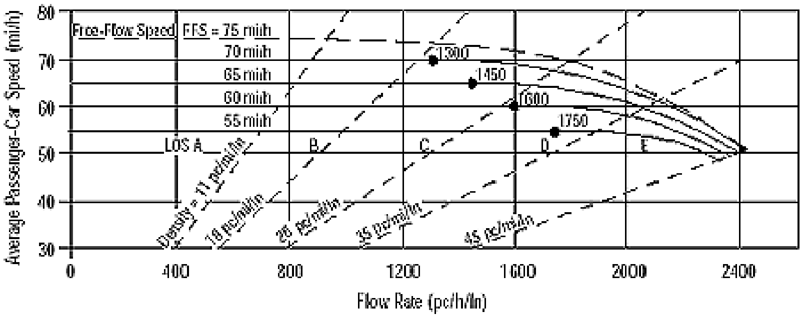
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14143*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2717*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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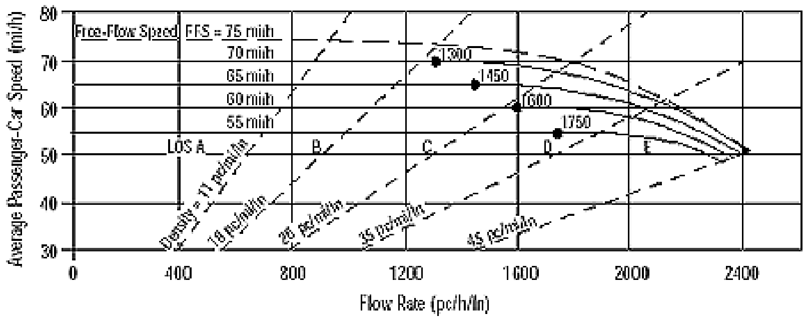
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7669*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1398*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*20.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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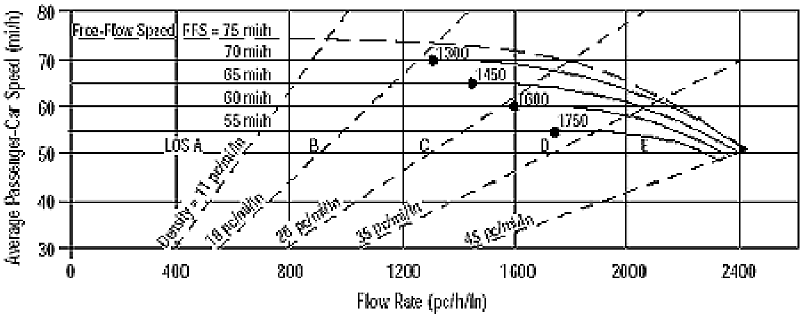
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5618*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1110*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*15.9*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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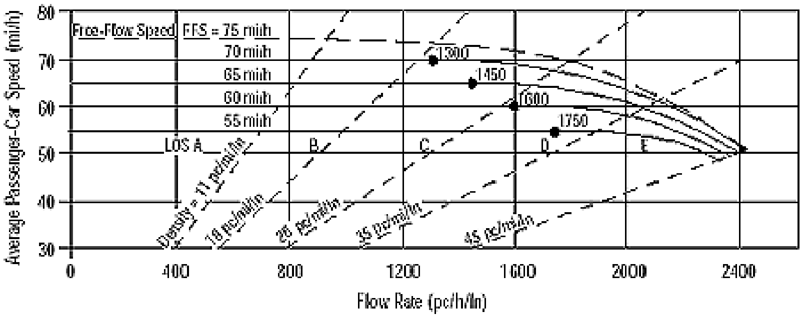
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14178*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2573*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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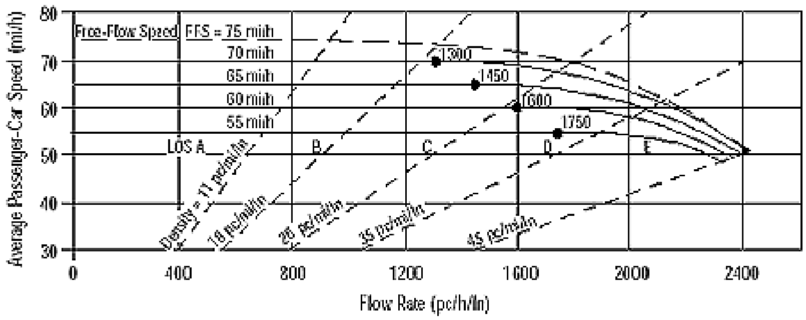
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*13149*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2526*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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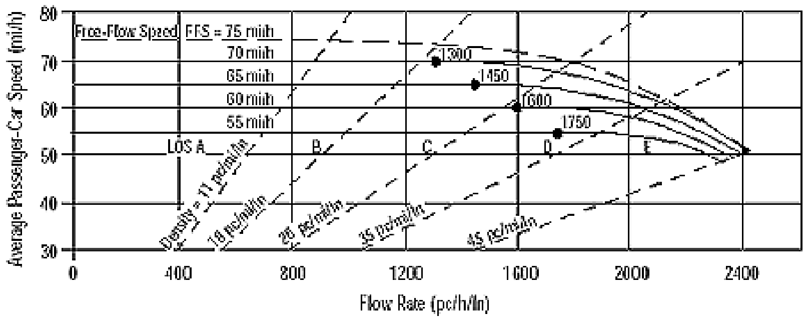
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7342*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1339*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*19.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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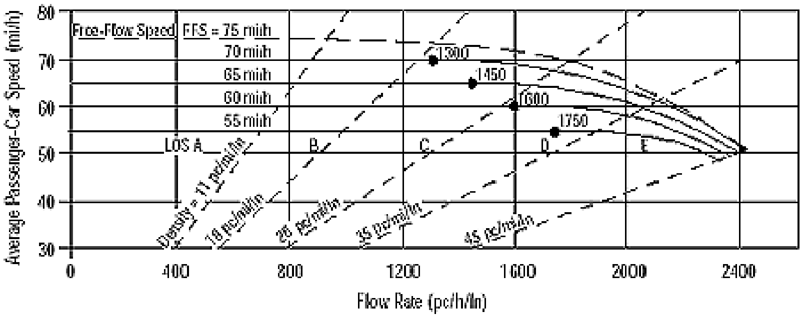
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2515*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*993*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*14.2*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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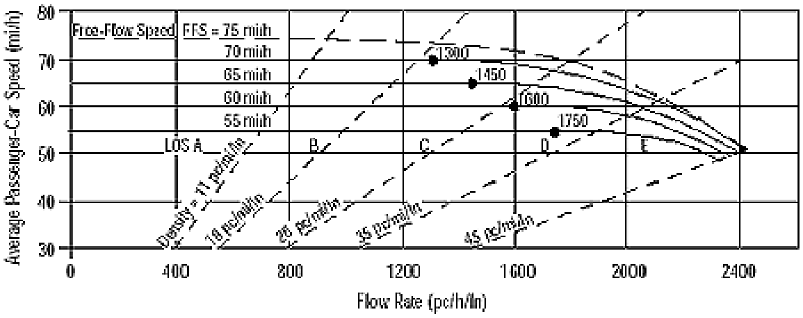
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5724*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2077*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*63.2*	mi/h	S	mi/h
D = v_p / S	*32.8*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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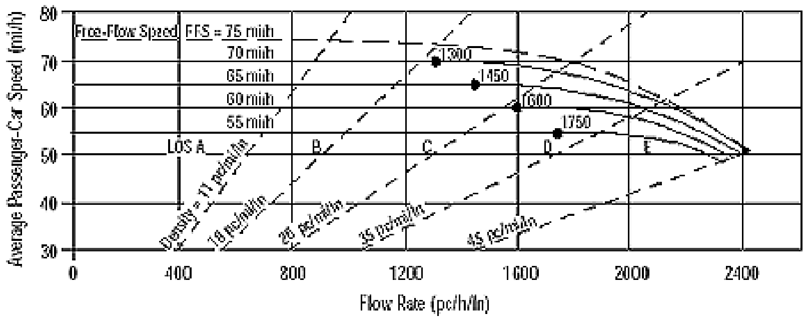
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4516*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1735*	pc/h/ln
S	*68.5*	mi/h
D = v_p / S	*25.3*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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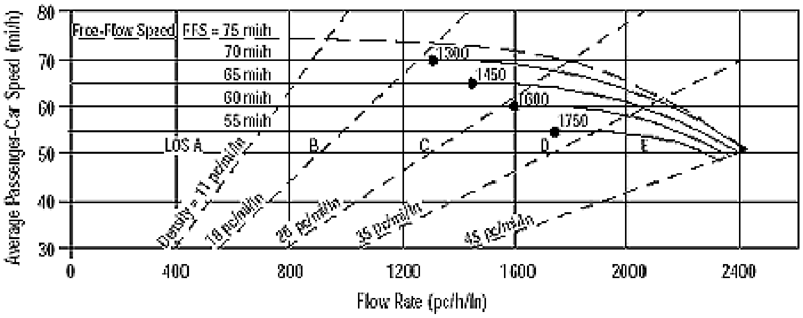
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*South of I-205*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3949*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1440*	pc/h/ln
S	*69.9*	mi/h
D = v_p / S	*20.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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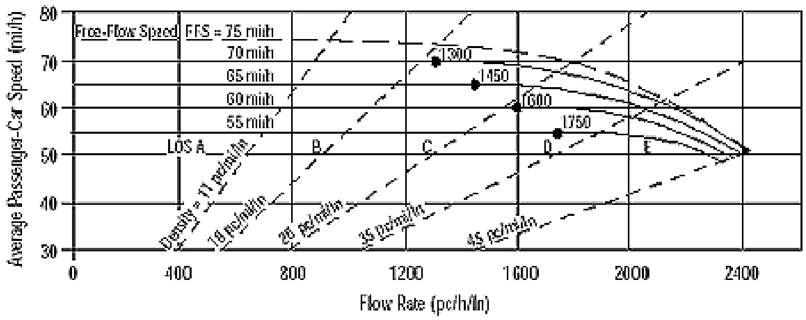
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4388*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1040*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*14.9*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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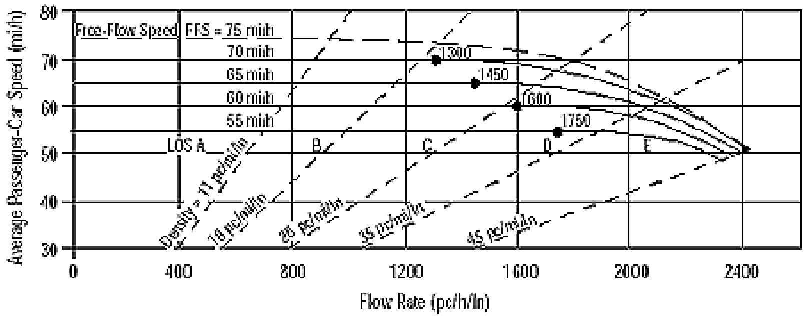
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8955*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1950*	pc/h/ln
S	*65.8*	mi/h
D = v_p / S	*29.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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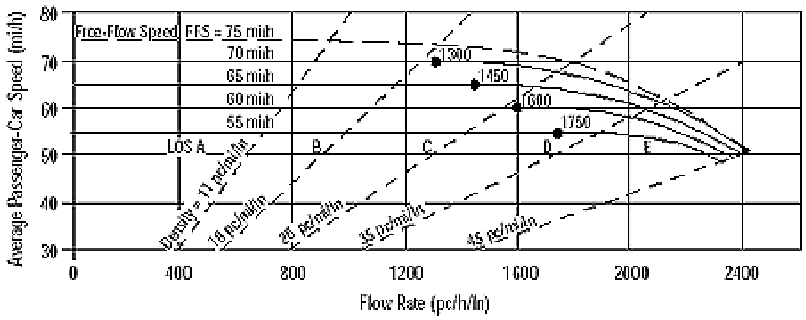
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*		
Agency or Company	*TJKM*		
Date Performed	*9/23/2009*		
Analysis Time Period	*AM Peak Hour*		

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8605*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1984*	pc/h/ln
S	*65.2*	mi/h
D = v_p / S	*30.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits23-8, 23-10
- E_T - Exhibits 23-8, 23-10, 23-11
- f_p - Page 23-12
- LOS, S, FFS, v_p - Exhibits 23-2, 23-3
- f_{LW} - Exhibit 23-4
- f_{LC} - Exhibit 23-5
- f_N - Exhibit 23-6
- f_{ID} - Exhibit 23-7

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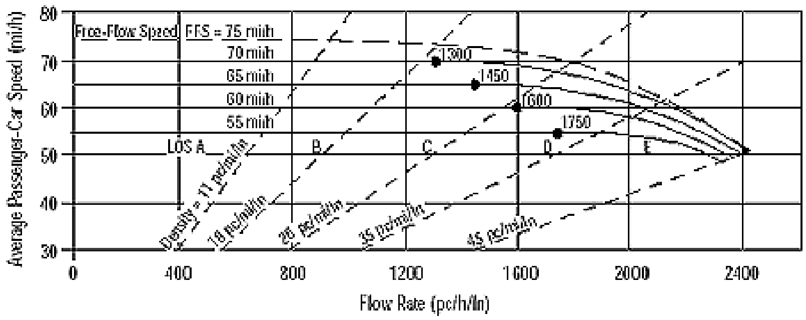
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5943*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1300*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*18.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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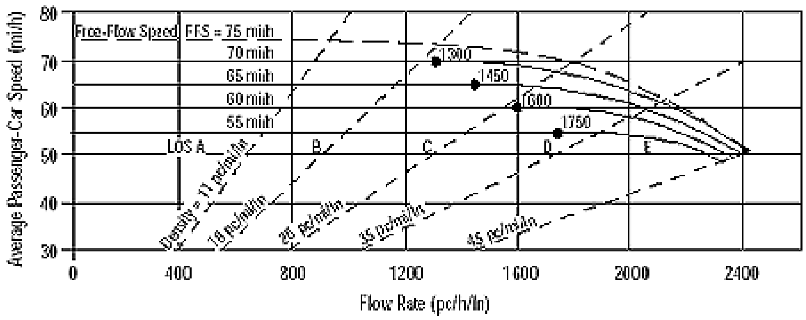
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*Louise Ave & SR-120*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7705*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1776*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*68.1*	mi/h	S	mi/h
D = v_p / S	*26.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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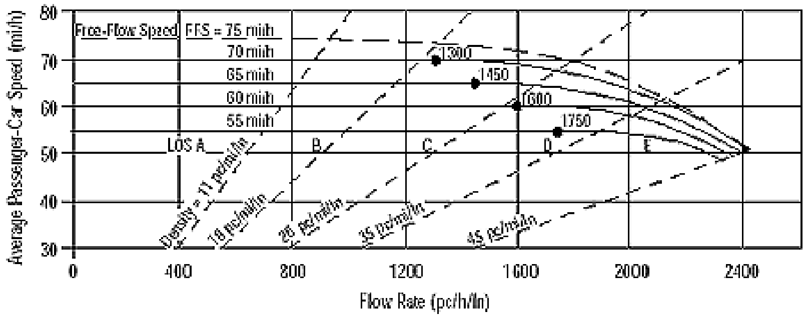
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*Louise Ave & SR-120*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

(Site Information in right column.)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5645*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1235*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*17.6*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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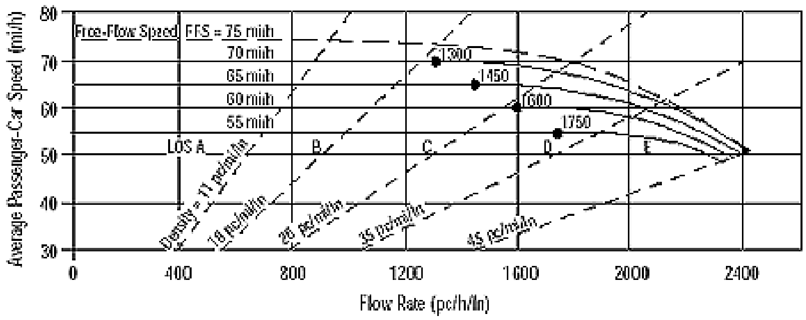
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*SR-120 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5427*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*804*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*11.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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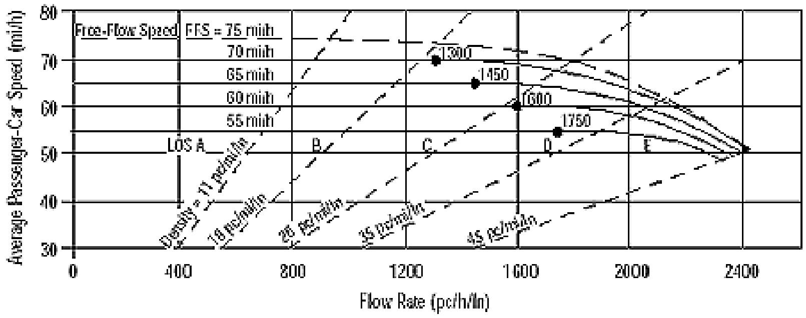
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14131*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1923*	pc/h/ln
S	*66.2*	mi/h
D = v_p / S	*29.0*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes; S - Speed
V - Hourly volume; D - Density
v_p - Flow rate; FFS - Free-flow speed
LOS - Level of service; BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10; f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11; f_{LC} - Exhibit 23-5
f_p - Page 23-12; f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3; f_{ID} - Exhibit 23-7

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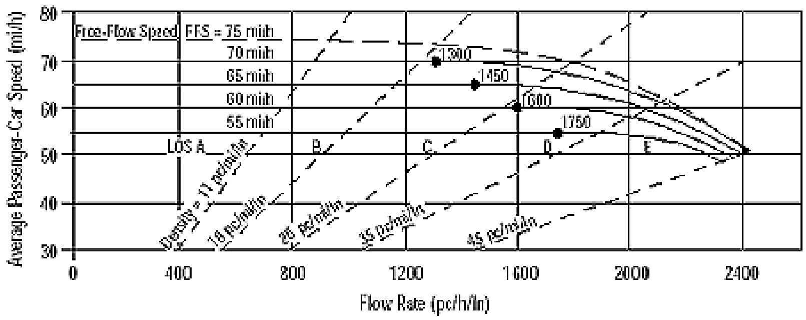
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*SR-120 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14143*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2038*	pc/h/ln
S	*64.1*	mi/h
D = v_p / S	*31.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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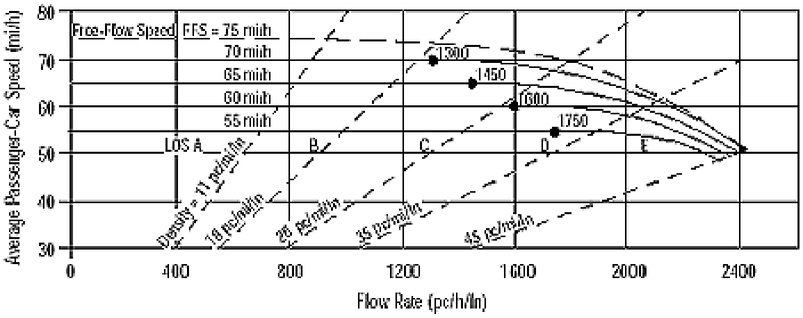
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7669*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1049*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*15.0*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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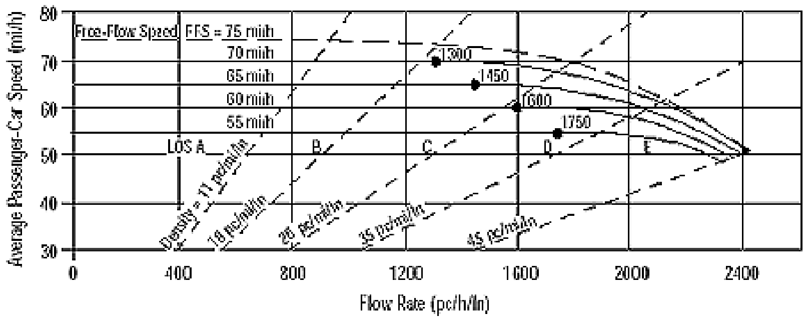
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5618*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*832*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*11.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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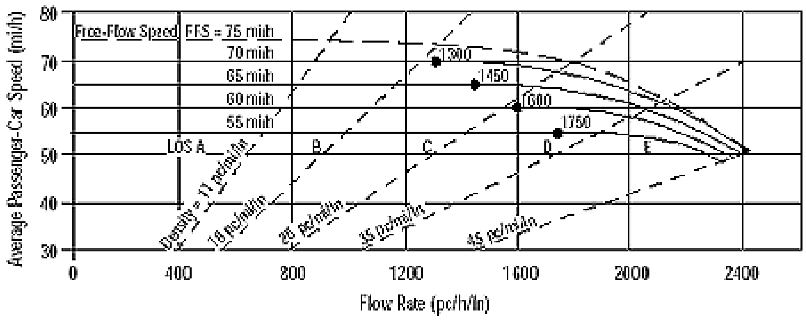
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14178*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1930*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*66.1*	mi/h	S	mi/h
D = v_p / S	*29.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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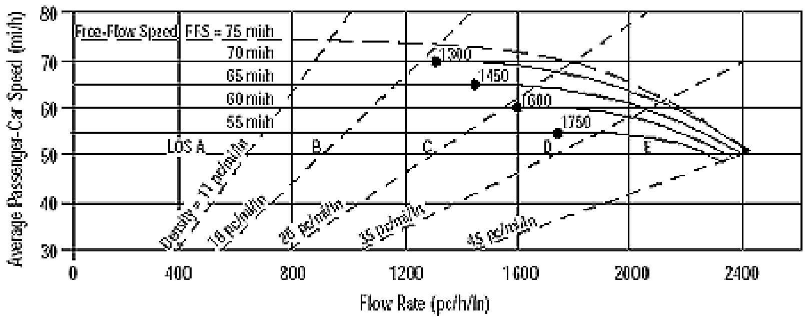
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

(Site Information in right columns)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*13149*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1895*	pc/h/ln
S	*66.6*	mi/h
D = v_p / S	*28.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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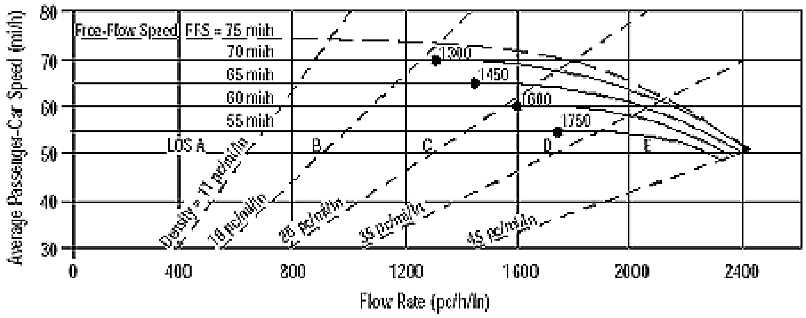
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7342*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1004*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*14.3*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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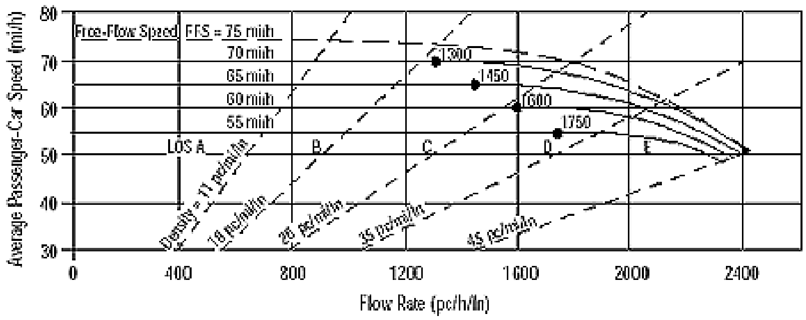
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 and Paradise*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3242*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*918*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*13.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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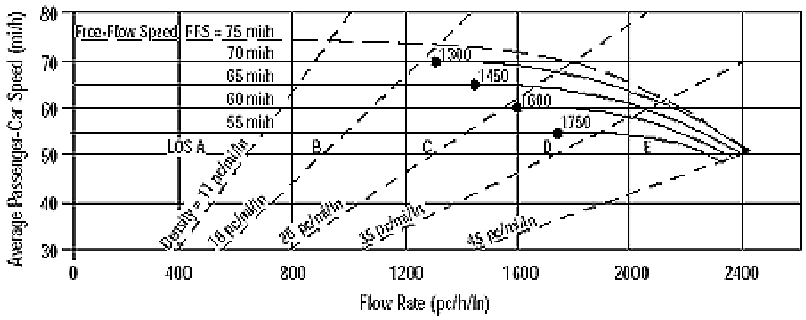
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 & Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8928*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2423*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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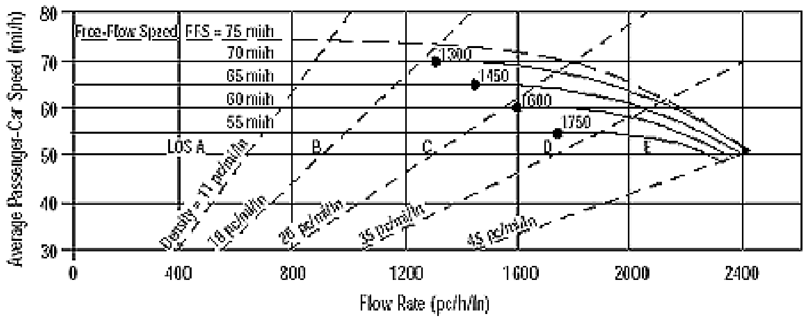
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8773*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2426*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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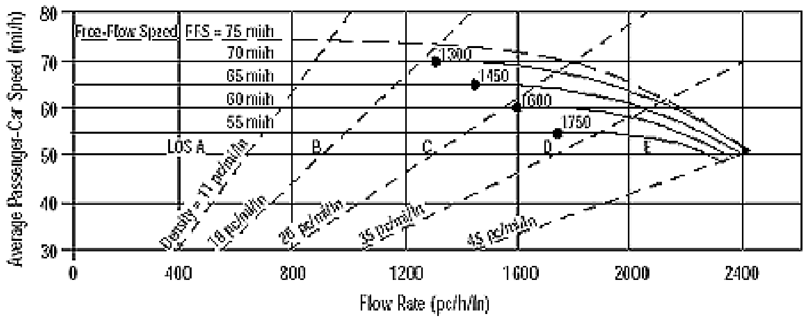
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3867*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1059*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*15.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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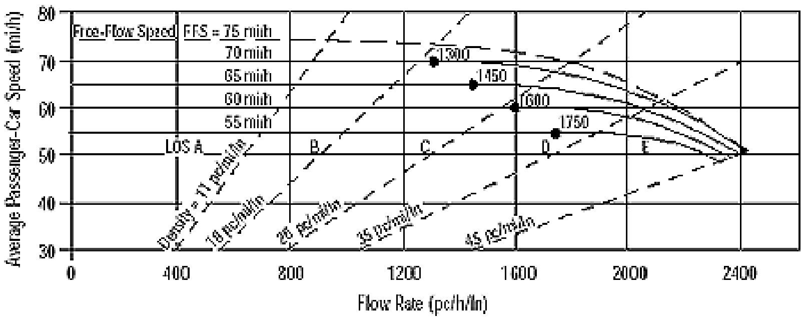
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*d*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*Paradise and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3992*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1130*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*16.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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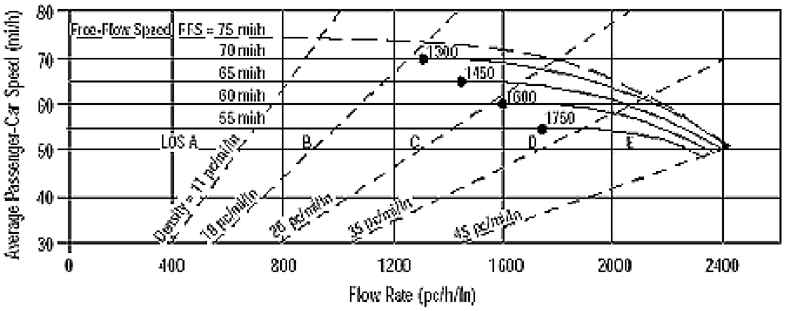
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		*Site Information*	
Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*Paradise Ave & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*9656*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]	*0.960*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2620*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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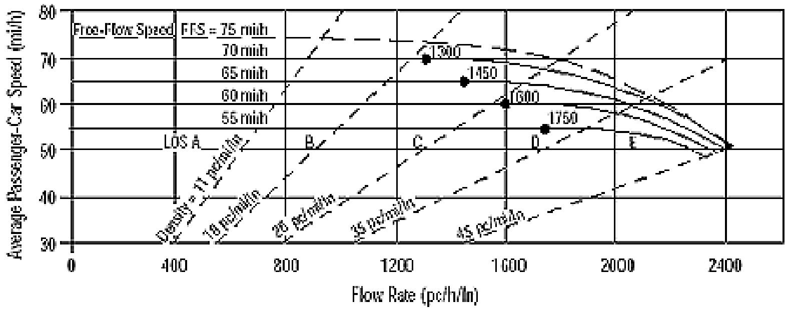
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*Paradise Ave & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9548*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2641*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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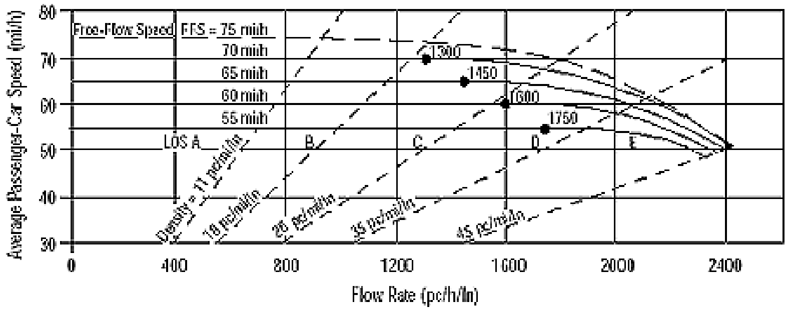
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*Paradise Ave & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4666*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1278*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*18.3*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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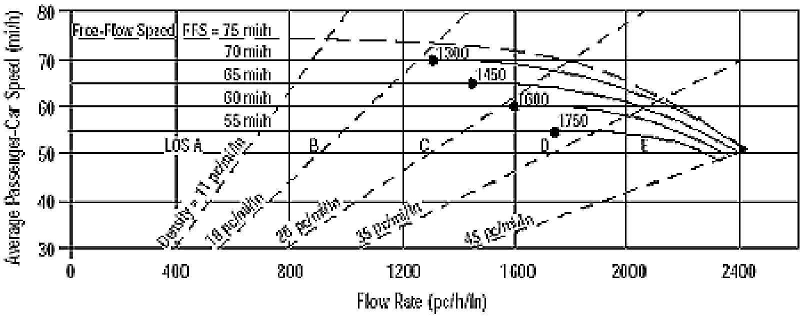
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*d*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3859*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1092*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*15.6*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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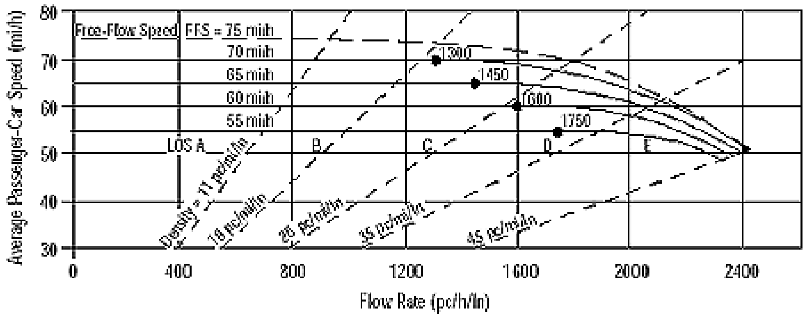
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*10154*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2755*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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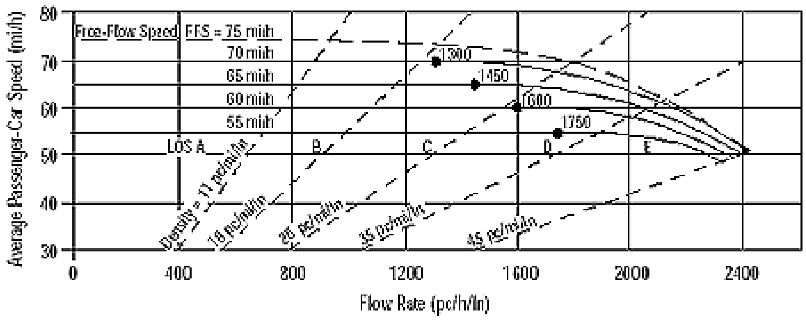
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		**Site Information**	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9926*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
<u>Operational (LOS)</u>			<u>Design (N)</u>	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2745*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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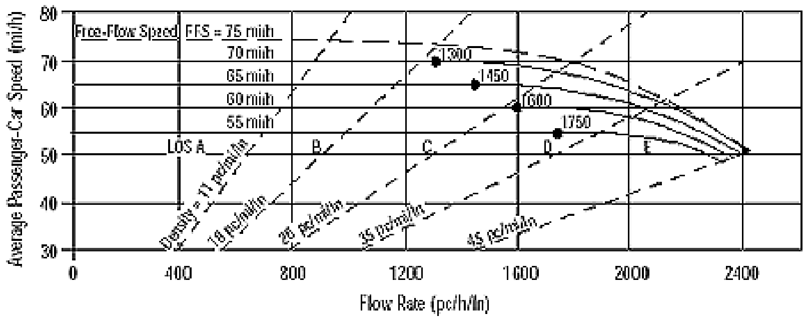
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5002*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1370*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*19.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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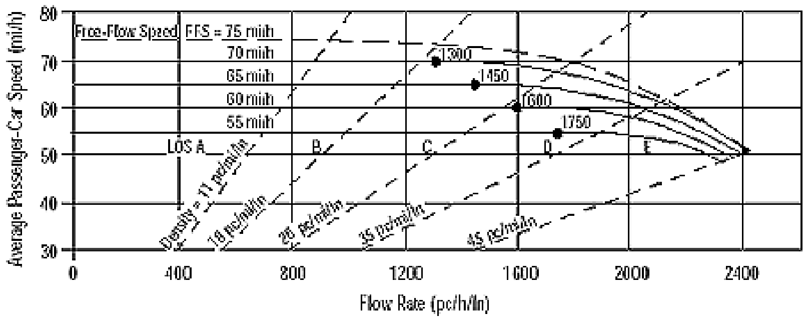
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3242*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*734*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.5*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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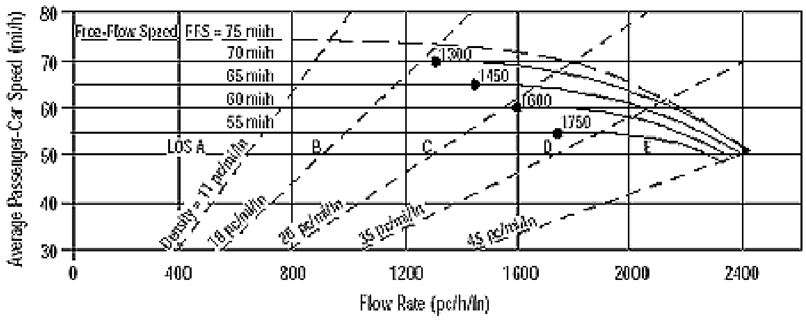
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 & Paradise*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8928*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1938*	pc/h/ln
S	*66.0*	mi/h
D = v_p / S	*29.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits23-8, 23-10
- E_T - Exhibits 23-8, 23-10, 23-11
- f_p - Page 23-12
- LOS, S, FFS, v_p - Exhibits 23-2, 23-3
- f_{LW} - Exhibit 23-4
- f_{LC} - Exhibit 23-5
- f_N - Exhibit 23-6
- f_{ID} - Exhibit 23-7

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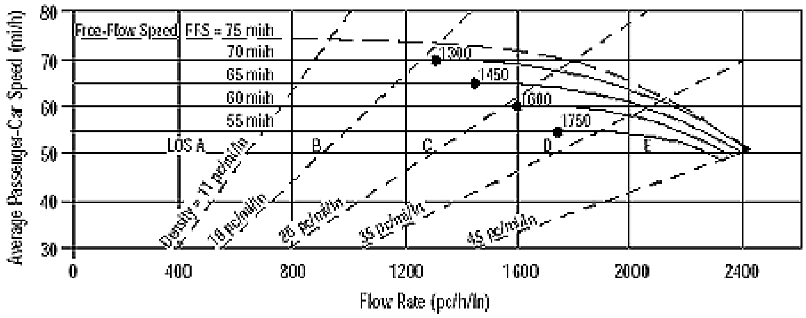
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8773*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1941*	pc/h/ln
S	*65.9*	mi/h
D = v_p / S	*29.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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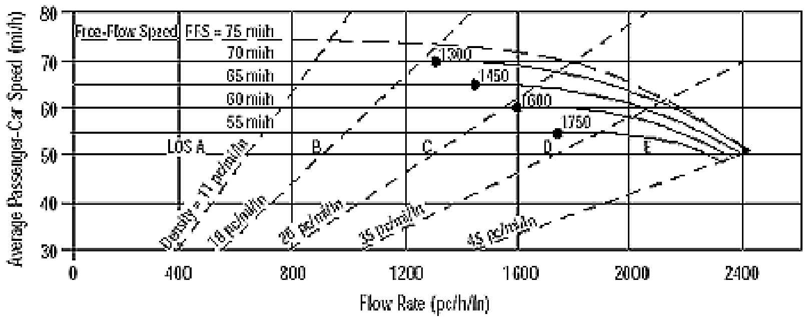
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	JL	Highway/Direction of Travel	I-205 WB
Agency or Company	TJKM	From/To	I-5 & Paradise
Date Performed	9/23/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj Miti

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	3867	veh/h	Peak-Hour Factor, PHF	0.96
AADT		veh/day	%Trucks and Buses, P_T	10
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.951

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f_{LC}		mi/h
Interchange Density	0.50	I/mi	f_{ID}		mi/h
Number of Lanes, N	5		f_N		mi/h
FFS (measured)	70.0	mi/h	FFS	70.0	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	848	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	70.0	mi/h	S	mi/h
D = v_p / S	12.1	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	B		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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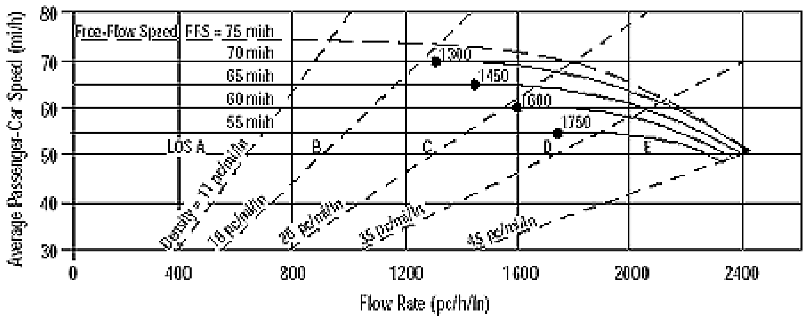
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*d*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*Paradise and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3992*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*904*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*12.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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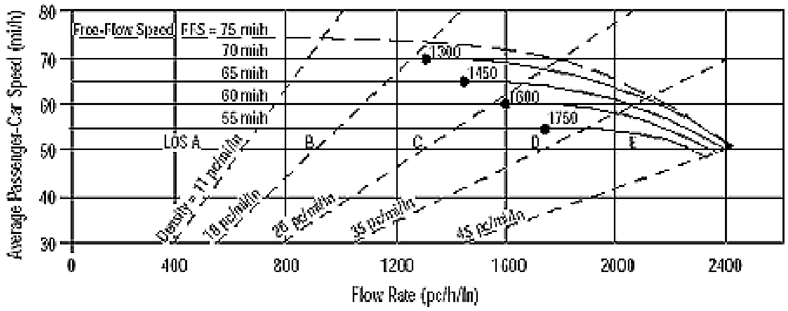
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*Paradise Ave & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9656*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2096*	pc/h/ln
S	*62.8*	mi/h
D = v_p / S	*33.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

Factor Location

- E_R - Exhibits23-8, 23-10
- f_{LW} - Exhibit 23-4
- E_T - Exhibits 23-8, 23-10, 23-11
- f_{LC} - Exhibit 23-5
- f_p - Page 23-12
- f_N - Exhibit 23-6
- LOS, S, FFS, v_p - Exhibits 23-2, 23-3
- f_{ID} - Exhibit 23-7

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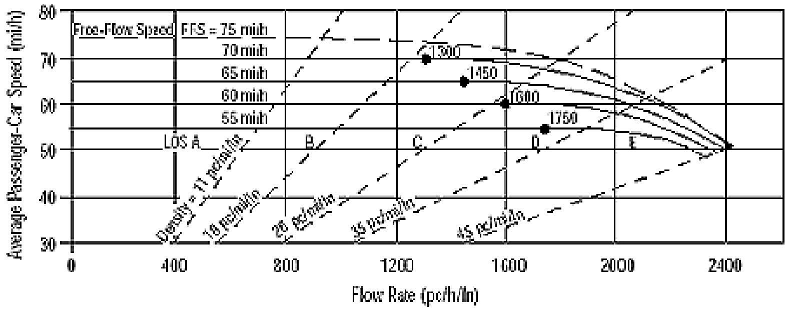
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*Paradise Ave & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9548*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2112*	pc/h/ln
S	*62.4*	mi/h
D = v_p / S	*33.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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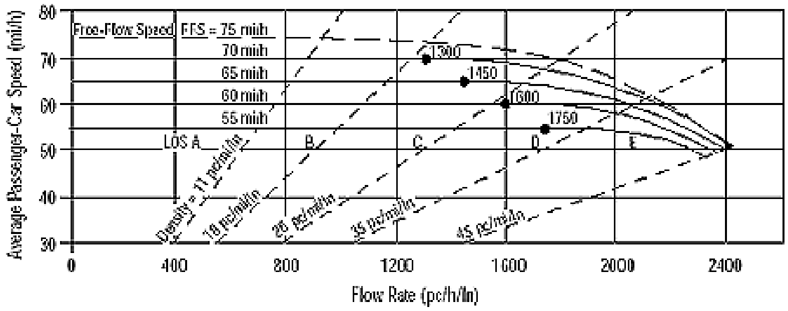
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*Paradise Ave & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4666*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1023*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*14.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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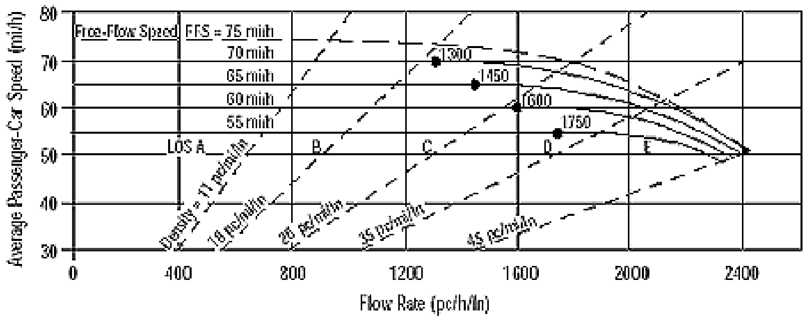
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*d*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3859*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*728*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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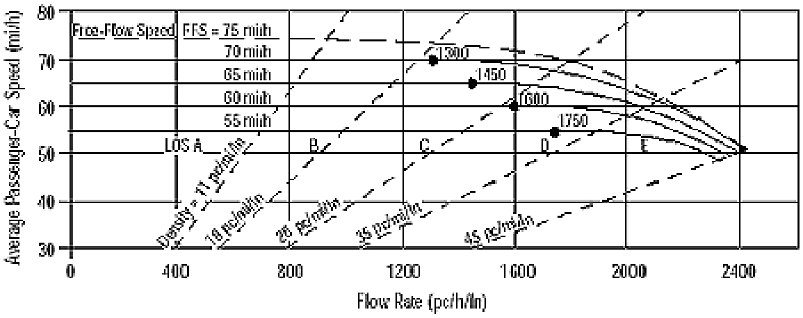
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*10154*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1837*	pc/h/ln
S	*67.4*	mi/h
D = v_p / S	*27.2*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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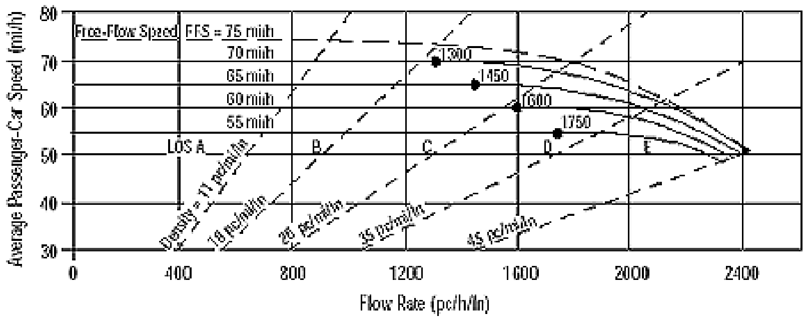
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9926*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1830*	pc/h/ln
S	*67.5*	mi/h
D = v_p / S	*27.1*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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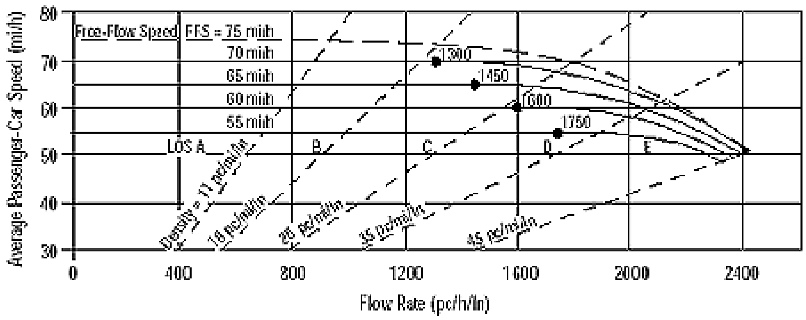
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5002*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*914*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*13.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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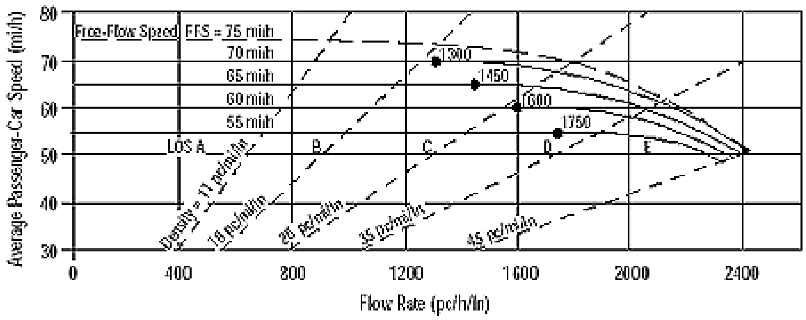
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 EB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1713*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*16*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.924*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*710*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.1*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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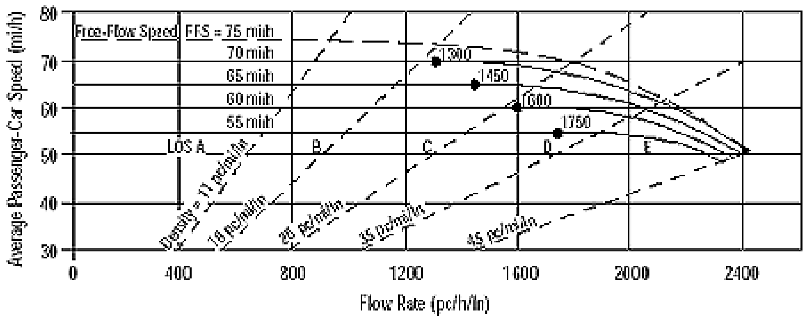
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*SR-120 EB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6970*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.964*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2510*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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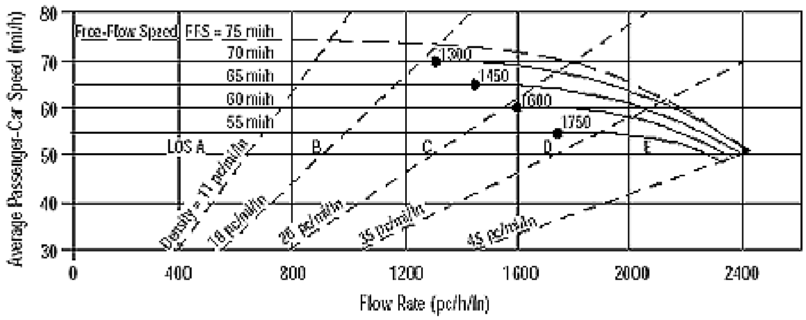
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 WB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6718*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*11*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.946*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2721*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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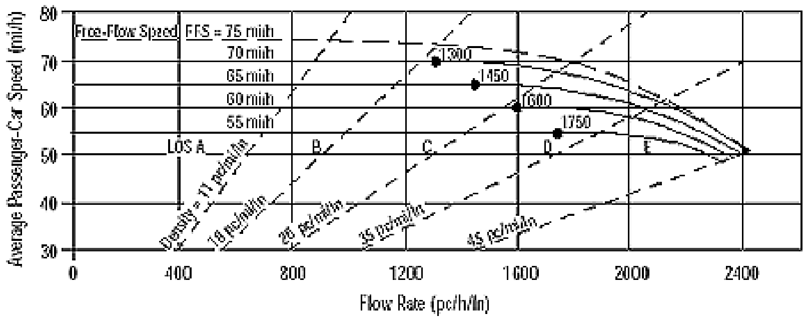
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 WB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2031 No Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2597*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*940*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*13.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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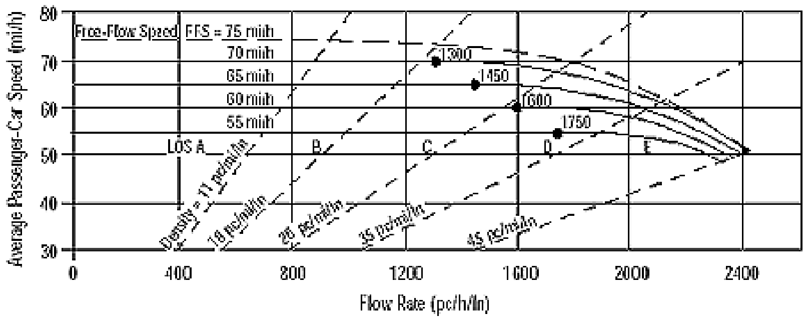
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*SR-120 EB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2030 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1713*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*16*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.924*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*533*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*7.6*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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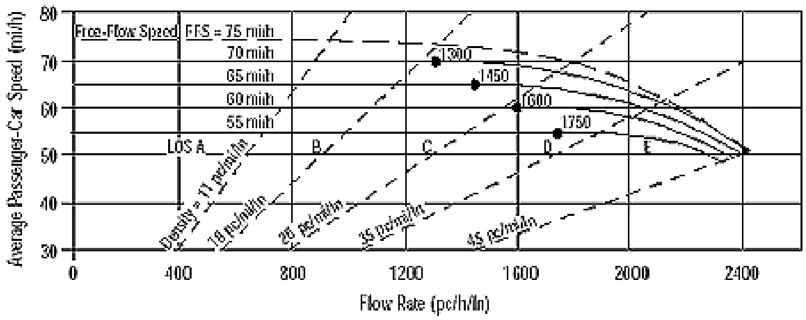
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*SR-120 EB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2030 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6970*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.964*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1882*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*66.8*	mi/h	S	mi/h
D = v_p / S	*28.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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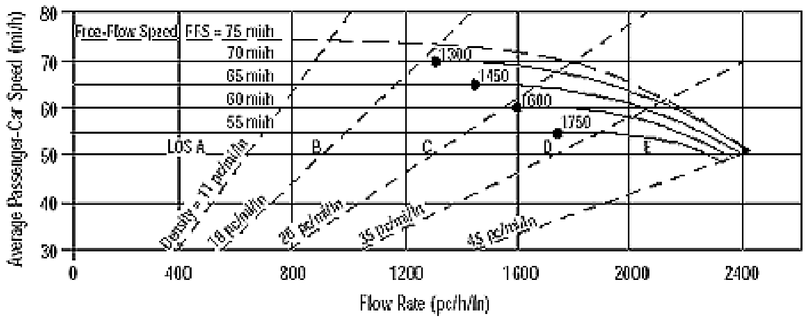
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	JL	Highway/Direction of Travel	SR-120 WB
Agency or Company	TJKM	From/To	East of I-5
Date Performed	9/23/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2030 No Proj Mitigated

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	6718	veh/h	Peak-Hour Factor, PHF	0.87
AADT		veh/day	%Trucks and Buses, P_T	11
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.946

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f_{LC}		mi/h
Interchange Density	0.50	I/mi	f_{ID}		mi/h
Number of Lanes, N	4		f_N		mi/h
FFS (measured)	70.0	mi/h	FFS	70.0	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	2040	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	64.1	mi/h	S	mi/h
D = v_p / S	31.8	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	D		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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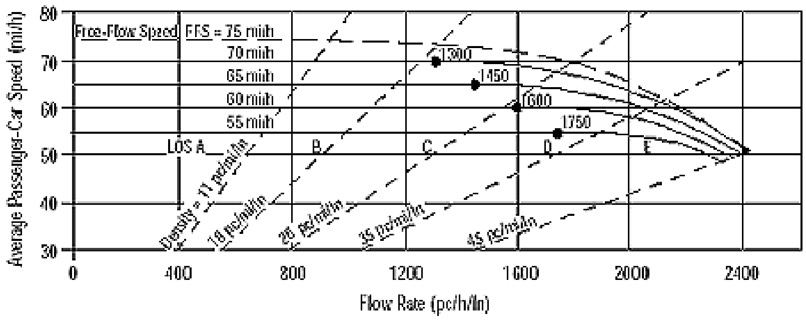
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*SR-120 WB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2030 No Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2597*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*564*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*8.1*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: [x] Yes [x] On [ ] No [ ] Off

L_{up} = 2900 ft

V_u = 929 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: [ ] Yes [ ] On [x] No [ ] Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3994	0.95	Level	20	1	0.907	1.00	4633
Ramp	749	0.95	Level	18	1	0.916	1.00	861
UpStream	929	0.95	Level	8	1	0.960	1.00	1019
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 968 pc/h

V_3 or V_{av34} 1832 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? [ ] Yes [x] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [x] Yes [ ] No

If Yes, V_{12a} = 1853 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5494	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2714	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 22.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.334 (Exibit 25-19)

S_R= 50.7 mph (Exhibit 25-19)

S_0= 51.8 mph (Exhibit 25-19)

S = 51.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? [ ] Yes [ ] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [ ] Yes [ ] No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2900 ft

V_u = 1431 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7735	0.95	Level	13	1	0.937	1.00	8688
Ramp	1530	0.95	Level	9	1	0.955	1.00	1686
UpStream	1431	0.95	Level	6	1	0.969	1.00	1555
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1816 pc/h

V_3 or V_{av34} 3436 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3475 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	10374	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5161	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 40.8 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.955 (Exibit 25-19)

S_R= 42.6 mph (Exhibit 25-19)

S_0= 46.6 mph (Exhibit 25-19)

S = 44.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: Yes ☐ On ☐ No ☑ Off ☐

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: Yes ☑ On ☐ No ☐ Off ☑

L_{down} = 1000 ft

V_D = 749 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4388	0.90	Level	19	1	0.912	1.00	5348
Ramp	929	0.90	Level	8	1	0.960	1.00	1076
UpStream								
DownStream	749	0.90	Level	18	1	0.916	1.00	909

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1118 pc/h

V_3 or V_{av34} 2115 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2139 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6424	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3215	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 25.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.361 (Exibit 25-19)

S_R= 50.3 mph (Exhibit 25-19)

S_0= 51.0 mph (Exhibit 25-19)

S = 50.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☐ On
☑ No ☐ Off		☐ No ☑ Off
L_{up} = ft	S_{FF} = 55.0 mph S_{FR} = 35.0 mph	L_{down} = 1000 ft
V_u = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 1530 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8955	0.90	Level	12	1	0.942	1.00	10567
Ramp	1431	0.90	Level	6	1	0.969	1.00	1641
UpStream								
DownStream	1530	0.90	Level	9	1	0.955	1.00	1780

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 2209 pc/h

V_3 or V_{av34} 4179 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4226 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	12208	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5867	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 45.4 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.642 (Exibit 25-19)

S_R= 33.7 mph (Exhibit 25-19)

S_0= 43.3 mph (Exhibit 25-19)

S = 38.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2785 ft

V_u = 1648 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	8605	0.90	Level	14	1	0.933	1.00	10250
Ramp	2334	0.90	Level	9	1	0.955	1.00	2715
UpStream	1648	0.90	Level	13	1	0.937	1.00	1954
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 2142 pc/h

V_3 or V_{av34} 4054 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4100 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	12965	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6815	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 52.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 3.821 (Exibit 25-19)

S_R= 5.3 mph (Exhibit 25-19)

S_0= 43.8 mph (Exhibit 25-19)

S = 9.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	374	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2785 ft

V_u = 2250 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5943	0.90	Level	13	1	0.937	1.00	7046
Ramp	1229	0.90	Level	8	1	0.960	1.00	1423
UpStream	2250	0.90	Level	16	1	0.924	1.00	2705
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1473 pc/h

V_3 or V_{av34} 2786 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2818 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8469	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4241	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 33.0 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.537 (Exibit 25-19)

S_R= 48.0 mph (Exhibit 25-19)

S_0= 49.2 mph (Exhibit 25-19)

S = 48.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 2785 ft

V_u = 2334 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	7705	0.90	Level	14	1	0.933	1.00	9178
Ramp	1648	0.90	Level	13	1	0.937	1.00	1954
UpStream	2334	0.90	Level	9	1	0.955	1.00	2715
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1918 pc/h

V_3 or V_{av34} 3630 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3671 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	11132	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5625	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 42.6 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.337 (Exibit 25-19)

S_R= 37.6 mph (Exhibit 25-19)

S_0= 45.8 mph (Exhibit 25-19)

S = 41.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: [x] Yes [ ] On [ ] No [x] Off

L_{up} = 2785 ft

V_u = 1229 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: [ ] Yes [ ] On [x] No [ ] Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5645	0.90	Level	14	1	0.933	1.00	6724
Ramp	2250	0.90	Level	16	1	0.924	1.00	2705
UpStream	1229	0.90	Level	8	1	0.960	1.00	1423
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1405 pc/h

V_3 or V_{av34} 2659 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? [ ] Yes [x] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [x] Yes [ ] No

If Yes, V_{12a} = 2689 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	9429	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5394	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 40.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.114 (Exibit 25-19)

S_R= 40.5 mph (Exhibit 25-19)

S_0= 49.5 mph (Exhibit 25-19)

S = 43.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? [ ] Yes [ ] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [ ] Yes [ ] No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Manthey Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 1162 ft

V_u = 106 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	13472	0.90	Level	13	1	0.937	1.00	15972
Ramp	756	0.90	Level	25	1	0.887	1.00	947
UpStream	106	0.90	Level	25	1	0.887	1.00	133
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.099 using Equation (Exhibit 25-5)

V_{12} = 1339 pc/h

V_3 or V_{av34} 6066 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 5388 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	14419	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6335	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 53.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.508 (Exibit 25-19)

S_R= 22.4 mph (Exhibit 25-19)

S_0= 38.0 mph (Exhibit 25-19)

S = 29.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Manthey Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 1162 ft

V_u = 196 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	7402	0.90	Level	17	1	0.920	1.00	8940
Ramp	747	0.90	Level	12	1	0.942	1.00	881
UpStream	196	0.90	Level	6	1	0.969	1.00	225
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.108 using Equation (Exhibit 25-5)

V_{12} = 693 pc/h

V_3 or V_{av34} 2873 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2576 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7321	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3457	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 30.9 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.432 (Exibit 25-19)

S_R= 49.4 mph (Exhibit 25-19)

S_0= 49.8 mph (Exhibit 25-19)

S = 49.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Manthey Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 1162 ft

V_D = 756 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	13149	0.90	Level	13	1	0.937	1.00	15589
Ramp	106	0.90	Level	25	1	0.887	1.00	133
UpStream								
DownStream	756	0.90	Level	25	1	0.887	1.00	947

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.201 using Equation (Exhibit 25-5)

V_{12} = 2633 pc/h

V_3 or V_{av34} 5228 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = 7689 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	13222	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	7822	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 65.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 10.038 (Exibit 25-19)

S_R= -75.5 mph (Exhibit 25-19)

S_0= 46.1 mph (Exhibit 25-19)

S = 971.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Manthey Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☐ On
☑ No ☐ Off		☐ No ☑ Off
L_{up} = ft	S_{FF} = 55.0 mph S_{FR} = 35.0 mph	L_{down} = 1160 ft
V_u = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 747 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	7342	0.90	Level	17	1	0.920	1.00	8868
Ramp	196	0.90	Level	6	1	0.969	1.00	225
UpStream								
DownStream	747	0.90	Level	12	1	0.942	1.00	881

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

- L_{EQ} = (Equation 25-2 or 25-3)
- P_{FM} = 0.190 using Equation (Exhibit 25-5)
- V_{12} = 1208 pc/h
- V_3 or V_{av34} 2580 pc/h (Equation 25-4 or 25-5)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No
- If Yes, V_{12a} = 2547 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6593	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2772	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

- D_R = 25.8 (pc/mi/ln)
- LOS = C (Exhibit 25-4)

Speed Determination

- M_S = 0.370 (Exibit 25-19)
- S_R= 50.2 mph (Exhibit 25-19)
- S_0= 49.9 mph (Exhibit 25-19)
- S = 50.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

- L_{EQ} = (Equation 25-8 or 25-9)
- P_{FD} = using Equation (Exhibit 25-12)
- V_{12} = pc/h
- V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
- If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

- D_R = (pc/mi/ln)
- LOS = (Exhibit 25-4)

Speed Determination

- D_s = (Exhibit 25-19)
- S_R= mph (Exhibit 25-19)
- S_0= mph (Exhibit 25-19)
- S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Mossdale Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 1473 ft

V_u = 174 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5291	0.90	Level	21	1	0.903	1.00	6508
Ramp	709	0.90	Level	22	1	0.899	1.00	876
UpStream	174	0.90	Level	7	1	0.964	1.00	200
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.108 using Equation (Exhibit 25-5)

V_{12} = 515 pc/h

V_3 or V_{av34} 2118 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 1900 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5627	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2776	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 25.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.370 (Exibit 25-19)

S_R= 50.2 mph (Exhibit 25-19)

S_0= 51.7 mph (Exhibit 25-19)

S = 50.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	dd	Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Mossdale Rd
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 1473 ft

V_u = 446 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	13686	0.90	Level	11	1	0.946	1.00	16073
Ramp	267	0.90	Level	5	1	0.974	1.00	305
UpStream	446	0.90	Level	4	1	0.978	1.00	506
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.180 using Equation (Exhibit 25-5)

V_{12} = 2439 pc/h

V_3 or V_{av34} 5567 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = 8173 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	13878	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	8478	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 70.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 19.058 (Exibit 25-19)

S_R= -192.8 mph (Exhibit 25-19)

S_0= 46.1 mph (Exhibit 25-19)

S = 189.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Mossdale Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 1473 ft

V_D = 709 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5427	0.90	Level	21	1	0.903	1.00	6675
Ramp	174	0.90	Level	7	1	0.964	1.00	200
UpStream								
DownStream	709	0.90	Level	22	1	0.899	1.00	876

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.193 using Equation (Exhibit 25-5)

V_{12} = 1287 pc/h

V_3 or V_{av34} 2694 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2670 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6875	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2870	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 26.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.373 (Exibit 25-19)

S_R= 50.1 mph (Exhibit 25-19)

S_0= 49.6 mph (Exhibit 25-19)

S = 49.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Mossdale Road
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 1473 ft

V_D = 267 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	14131	0.90	Level	11	1	0.946	1.00	16596
Ramp	446	0.90	Level	4	1	0.978	1.00	506
UpStream								
DownStream	267	0.90	Level	5	1	0.974	1.00	305

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.155 using Equation (Exhibit 25-5)

V_{12} = 2565 pc/h

V_3 or V_{av34} 7015 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = 11196 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	17102	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	11702	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 95.1 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 471.476 (Exibit 25-19)

S_R= -6074.2 mph (Exhibit 25-19)

S_0= 46.1 mph (Exhibit 25-19)

S = 148.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2000 ft

V_u = 304 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3859	0.90	Level	18	1	0.916	1.00	4682
Ramp	133	0.90	Level	25	1	0.887	1.00	167
UpStream	304	0.90	Level	24	1	0.891	1.00	379
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.197 using Equation (Exhibit 25-5)

V_{12} = 922 pc/h

V_3 or V_{av34} 1880 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1872 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4849	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2039	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 20.0 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.337 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 51.7 mph (Exhibit 25-19)

S = 51.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: [x] Yes [x] On; [ ] No [ ] Off

L_{up} = 2000 ft

V_u = 1487 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: [ ] Yes [ ] On; [x] No [ ] Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	10154	0.90	Level	9	1	0.955	1.00	11812
Ramp	1682	0.90	Level	23	1	0.895	1.00	2088
UpStream	1487	0.90	Level	9	1	0.955	1.00	1730
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = -0.043 using Equation (Exhibit 25-5)

V_{12} = -509 pc/h

V_3 or V_{av34} 6160 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? [x] Yes [ ] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [x] Yes [ ] No

If Yes, V_{12a} = 4724 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	13900	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6812	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 56.4 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 3.851 (Exibit 25-19)

S_R= 4.9 mph (Exhibit 25-19)

S_0= 41.0 mph (Exhibit 25-19)

S = 9.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? [ ] Yes [ ] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [ ] Yes [ ] No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{down} = 2000 ft
V_D = 133 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3992	0.90	Level	17	1	0.920	1.00	4821
Ramp	304	0.90	Level	24	1	0.891	1.00	379
UpStream								
DownStream	133	0.90	Level	18	1	0.916	1.00	161

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.170 using Equation (Exhibit 25-5)

V_{12} = 822 pc/h

V_3 or V_{av34} 1999 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1928 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5200	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2307	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 21.5 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.341 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 51.6 mph (Exhibit 25-19)

S = 51.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	2030 No Proj
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off; L_{down} = 2000 ft; V_D = 1682 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	9656	0.90	Level	8	1	0.960	1.00	11180
Ramp	1487	0.90	Level	9	1	0.955	1.00	1730
UpStream								
DownStream	1682	0.90	Level	23	1	0.895	1.00	2088

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.002 using Equation (Exhibit 25-5)

V_{12} = 17 pc/h

V_3 or V_{av34} 5581 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4472 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	12910	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6202	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 51.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.227 (Exibit 25-19)

S_R= 26.0 mph (Exhibit 25-19)

S_0= 42.1 mph (Exhibit 25-19)

S = 32.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2100 ft

V_u = 1299 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	9548	0.90	Level	12	1	0.942	1.00	11267
Ramp	959	0.90	Level	15	1	0.929	1.00	1148
UpStream	1299	0.90	Level	25	1	0.887	1.00	1627
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.074 using Equation (Exhibit 25-5)

V_{12} = 837 pc/h

V_3 or V_{av34} 5215 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4506 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	12415	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5654	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 47.9 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.422 (Exibit 25-19)

S_R= 36.5 mph (Exhibit 25-19)

S_0= 42.0 mph (Exhibit 25-19)

S = 39.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2100 ft

V_u = 596 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4666	0.90	Level	10	1	0.951	1.00	5454
Ramp	563	0.90	Level	14	1	0.933	1.00	671
UpStream	596	0.90	Level	9	1	0.955	1.00	693
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.134 using Equation (Exhibit 25-5)

V_{12} = 730 pc/h

V_3 or V_{av34} 2362 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2181 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6125	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2852	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 26.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.376 (Exibit 25-19)

S_R= 50.1 mph (Exhibit 25-19)

S_0= 50.9 mph (Exhibit 25-19)

S = 50.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	MacArthur Dr
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 2100 ft

V_D = 596 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9926	0.90	Level	13	1	0.937	1.00	11768
Ramp	1299	0.90	Level	25	1	0.887	1.00	1627
UpStream								
DownStream	596	0.90	Level	15	1	0.929	1.00	713

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.014 using Equation (Exhibit 25-5)

V_{12} = 170 pc/h

V_3 or V_{av34} 5799 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4707 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	13395	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6334	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 52.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.497 (Exibit 25-19)

S_R= 22.5 mph (Exhibit 25-19)

S_0= 41.1 mph (Exhibit 25-19)

S = 29.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	MacArthur Dr
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2100 ft

V_D = 563 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5002	0.90	Level	9	1	0.955	1.00	5819
Ramp	596	0.90	Level	9	1	0.955	1.00	693
UpStream								
DownStream	563	0.90	Level	14	0	0.935	1.00	669

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.131 using Equation (Exhibit 25-5)

V_{12} = 763 pc/h

V_3 or V_{av34} 2528 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2327 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6512	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3020	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 26.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.380 (Exibit 25-19)

S_R= 50.1 mph (Exhibit 25-19)

S_0= 50.5 mph (Exhibit 25-19)

S = 50.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	3992	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2000 ft

V_u = 485 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3992	0.90	Level	18	1	0.916	1.00	4844
Ramp	761	0.90	Level	25	1	0.887	1.00	953
UpStream	485	0.90	Level	24	1	0.891	1.00	605
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.099 using Equation (Exhibit 25-5)

V_{12} = 478 pc/h

V_3 or V_{av34} 2183 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1937 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5797	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2890	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 26.3 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.377 (Exibit 25-19)

S_R= 50.1 mph (Exhibit 25-19)

S_0= 51.6 mph (Exhibit 25-19)

S = 50.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: [x] Yes [x] On [ ] No [ ] Off

L_{up} = 2000 ft

V_u = 868 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: [ ] Yes [ ] On [x] No [ ] Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	9656	0.90	Level	9	1	0.955	1.00	11233
Ramp	1074	0.90	Level	23	1	0.895	1.00	1333
UpStream	868	0.90	Level	9	1	0.955	1.00	1010
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.051 using Equation (Exhibit 25-5)

V_{12} = 575 pc/h

V_3 or V_{av34} 5329 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? [x] Yes [ ] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [x] Yes [ ] No

If Yes, V_{12a} = 4493 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	12566	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5826	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 49.1 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.629 (Exibit 25-19)

S_R= 33.8 mph (Exhibit 25-19)

S_0= 42.0 mph (Exhibit 25-19)

S = 37.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? [ ] Yes [ ] No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 [ ] Yes [ ] No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 2000 ft

V_D = 180 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3242	0.90	Level	17	1	0.920	1.00	3916
Ramp	485	0.90	Level	24	1	0.891	1.00	605
UpStream								
DownStream	180	0.90	Level	18	1	0.916	1.00	218

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.142 using Equation (Exhibit 25-5)

V_{12} = 557 pc/h

V_3 or V_{av34} 1679 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1566 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4521	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2171	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 20.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.336 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 52.6 mph (Exhibit 25-19)

S = 51.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 2000 ft

V_D = 1074 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	8928	0.90	Level	8	1	0.960	1.00	10337
Ramp	868	0.90	Level	9	1	0.955	1.00	1010
UpStream								
DownStream	1074	0.90	Level	23	1	0.895	1.00	1333

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.092 using Equation (Exhibit 25-5)

V_{12} = 946 pc/h

V_3 or V_{av34} 4695 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4134 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	11347	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5144	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 43.4 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.970 (Exibit 25-19)

S_R= 42.4 mph (Exhibit 25-19)

S_0= 43.7 mph (Exhibit 25-19)

S = 43.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2100 ft

V_u = 1242 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	8773	0.90	Level	12	1	0.942	1.00	10352
Ramp	941	0.90	Level	15	1	0.929	1.00	1126
UpStream	1242	0.90	Level	25	1	0.887	1.00	1555
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.077 using Equation (Exhibit 25-5)

V_{12} = 798 pc/h

V_3 or V_{av34} 4777 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4140 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	11478	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5266	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 44.9 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.064 (Exibit 25-19)

S_R= 41.2 mph (Exhibit 25-19)

S_0= 43.6 mph (Exhibit 25-19)

S = 42.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2100 ft

V_u = 999 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3867	0.90	Level	10	1	0.951	1.00	4520
Ramp	722	0.90	Level	14	1	0.933	1.00	860
UpStream	999	0.90	Level	9	1	0.955	1.00	1162
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.110 using Equation (Exhibit 25-5)

V_{12} = 499 pc/h

V_3 or V_{av34} 2010 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1808 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5380	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2668	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 24.8 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.365 (Exibit 25-19)

S_R= 50.3 mph (Exhibit 25-19)

S_0= 51.9 mph (Exhibit 25-19)

S = 51.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2100 ft

V_D = 941 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	9548	0.90	Level	13	1	0.937	1.00	11320
Ramp	1242	0.90	Level	25	1	0.887	1.00	1555
UpStream								
DownStream	941	0.90	Level	15	1	0.929	1.00	1126

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.023 using Equation (Exhibit 25-5)

V_{12} = 265 pc/h

V_3 or V_{av34} 5527 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 4528 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	12875	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6083	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 50.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.010 (Exibit 25-19)

S_R= 28.9 mph (Exhibit 25-19)

S_0= 41.9 mph (Exhibit 25-19)

S = 34.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 No Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2100 ft

V_D = 722 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4666	0.90	Level	9	1	0.955	1.00	5428
Ramp	999	0.90	Level	9	1	0.955	1.00	1162
UpStream								
DownStream	722	0.90	Level	14	0	0.935	1.00	858

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.073 using Equation (Exhibit 25-5)

V_{12} = 394 pc/h

V_3 or V_{av34} 2517 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2171 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6590	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3333	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 29.1 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.409 (Exibit 25-19)

S_R= 49.7 mph (Exhibit 25-19)

S_0= 50.9 mph (Exhibit 25-19)

S = 50.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Appendix I – Level of Service Worksheets: Year 2031 With Action

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	381	1232	40	1589	1815	492	71	467	816	562	1161	967
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	401	1297	42	1673	1911	518	75	492	859	592	1222	1018
RTOR Reduction (vph)	0	0	13	0	0	232	0	0	4	0	0	257
Lane Group Flow (vph)	401	1297	29	1673	1911	286	75	492	855	592	1222	761
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	19.3	27.7	27.7	28.8	37.2	37.2	5.8	25.7	54.5	18.8	38.7	38.7
Effective Green, g (s)	19.5	29.0	29.0	29.0	38.5	38.5	6.0	27.0	56.0	19.0	40.0	40.0
Actuated g/C Ratio	0.16	0.24	0.24	0.24	0.32	0.32	0.05	0.22	0.47	0.16	0.33	0.33
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	558	1229	383	1206	1631	508	89	1144	1301	790	1695	528
v/s Ratio Prot	0.12	0.26		c0.34	c0.38		0.04	0.10	0.16	c0.12	0.24	
v/s Ratio Perm			0.02			0.18			0.15			c0.48
v/c Ratio	0.72	1.06	0.08	1.39	1.17	0.56	0.84	0.43	0.66	0.75	0.72	1.44
Uniform Delay, d1	47.6	45.5	35.1	45.5	40.8	33.8	56.5	39.9	24.6	48.2	35.1	40.0
Progression Factor	1.13	0.96	0.94	0.93	0.95	0.91	0.90	0.90	0.61	1.00	1.00	1.00
Incremental Delay, d2	3.7	39.5	0.3	174.7	77.9	0.4	43.6	0.2	1.1	3.9	1.5	209.4
Delay (s)	57.3	83.3	33.5	216.9	116.8	31.2	94.7	36.1	16.1	52.1	36.6	249.4
Level of Service	E	F	C	F	F	C	F	D	B	D	D	F
Approach Delay (s)		76.1			146.8			27.2			116.4	
Approach LOS		E			F			C			F	

Intersection Summary			
HCM Average Control Delay	109.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	108.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.97	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4690	1375		4456	1263				3155		2561
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4690	1375		4456	1263				3155		2561
Volume (vph)	0	1119	1413	0	2048	425	0	0	0	272	0	2099
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1178	1487	0	2156	447	0	0	0	286	0	2209
RTOR Reduction (vph)	0	41	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1477	1147	0	2156	447	0	0	0	286	0	2209
Heavy Vehicles (%)	1%	1%	1%	10%	10%	10%	2%	2%	2%	11%	11%	11%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		42.7	120.0		42.7	120.0				67.4		67.4
Effective Green, g (s)		44.0	120.0		44.0	120.0				68.0		68.0
Actuated g/C Ratio		0.37	1.00		0.37	1.00				0.57		0.57
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		1720	1375		1634	1263				1788		1451
v/s Ratio Prot		0.31			c0.48							
v/s Ratio Perm			0.83			0.35				0.09		c0.86
v/c Ratio		0.86	0.83		1.32	0.35				0.16		1.52
Uniform Delay, d1		35.1	0.0		38.0	0.0				12.4		26.0
Progression Factor		0.71	1.00		0.56	1.00				1.00		1.00
Incremental Delay, d2		2.9	3.0		145.8	0.4				0.0		238.6
Delay (s)		27.9	3.0		167.0	0.4				12.4		264.6
Level of Service		C	A		F	A				B		F
Approach Delay (s)		17.2			138.4			0.0			235.7	
Approach LOS		B			F			A			F	

Intersection Summary			
HCM Average Control Delay	128.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	122.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3273	3374			4456	1263	1466	1471	2429			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3273	3374			4456	1263	1466	1471	2429			
Volume (vph)	498	893	0	0	2176	570	297	5	445	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	524	940	0	0	2291	600	313	5	468	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	210	0	0	341	0	0	0
Lane Group Flow (vph)	524	940	0	0	2291	390	157	161	127	0	0	0
Heavy Vehicles (%)	7%	7%	7%	10%	10%	10%	17%	17%	17%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	21.2	93.7			69.0	69.0	16.4	16.4	16.4			
Effective Green, g (s)	21.4	95.0			69.6	69.6	17.0	17.0	17.0			
Actuated g/C Ratio	0.18	0.79			0.58	0.58	0.14	0.14	0.14			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	584	2671			2584	733	208	208	344			
v/s Ratio Prot	c0.16	0.28			c0.51		0.11	c0.11				
v/s Ratio Perm						0.31			0.05			
v/c Ratio	0.90	0.35			0.89	0.53	0.75	0.77	0.37			
Uniform Delay, d1	48.2	3.6			21.8	15.3	49.5	49.6	46.6			
Progression Factor	0.55	0.30			0.39	0.26	1.00	1.00	1.00			
Incremental Delay, d2	11.9	0.2			0.5	0.3	14.4	16.3	0.7			
Delay (s)	38.4	1.3			9.0	4.3	63.9	65.9	47.3			
Level of Service	D	A			A	A	E	E	D			
Approach Delay (s)		14.6			8.0			54.4			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1626	4673	1455	1671	4749		2993	1581		1480	2873	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1626	4673	1455	1671	4749		2993	1581		1480	2873	
Volume (vph)	154	794	265	120	1948	158	580	445	96	189	405	98
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	162	836	279	126	2051	166	611	468	101	199	426	103
RTOR Reduction (vph)	0	0	211	0	8	0	0	6	0	0	18	0
Lane Group Flow (vph)	162	836	68	126	2209	0	611	563	0	199	511	0
Heavy Vehicles (%)	11%	11%	11%	8%	8%	8%	17%	17%	17%	22%	22%	22%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	9.8	28.7	28.7	26.5	45.4		25.3	33.7		12.8	21.9	
Effective Green, g (s)	10.0	29.3	29.3	26.7	46.0		25.5	35.0		13.0	22.5	
Actuated g/C Ratio	0.08	0.24	0.24	0.22	0.38		0.21	0.29		0.11	0.19	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	136	1141	355	372	1820		636	461		160	539	
v/s Ratio Prot	c0.10	0.18		0.08	c0.47		0.20	c0.36		c0.13	0.18	
v/s Ratio Perm			0.05									
v/c Ratio	1.19	0.73	0.19	0.34	1.21		0.96	1.22		1.24	0.95	
Uniform Delay, d1	55.0	41.7	36.0	39.2	37.0		46.8	42.5		53.5	48.2	
Progression Factor	0.82	0.73	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	133.8	3.8	1.1	0.5	101.5		26.1	117.5		151.3	26.1	
Delay (s)	179.0	34.2	36.5	39.8	138.5		72.9	160.0		204.8	74.3	
Level of Service	F	C	D	D	F		E	F		F	E	
Approach Delay (s)		53.1			133.2			114.9			110.0	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM Average Control Delay	107.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	102.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	298	106	96	8	44	72	105	800	33	84	1780	256
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	314	112	101	8	46	76	111	842	35	88	1874	269
RTOR Reduction (vph)	0	0	77	0	0	69	0	0	16	0	0	79
Lane Group Flow (vph)	314	112	24	8	46	7	111	842	19	88	1874	190
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.8	27.4	27.4	0.9	9.5	9.5	7.7	62.9	62.9	9.8	65.0	65.0
Effective Green, g (s)	19.0	28.7	28.7	1.1	10.8	10.8	7.9	64.2	64.2	10.0	66.3	66.3
Actuated g/C Ratio	0.16	0.24	0.24	0.01	0.09	0.09	0.07	0.54	0.54	0.08	0.55	0.55
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	280	446	379	16	168	251	117	1893	847	148	1955	875
v/s Ratio Prot	c0.18	c0.06		0.00	0.02		c0.06	0.24		0.05	c0.53	
v/s Ratio Perm			0.02			0.00			0.01			0.12
v/c Ratio	1.12	0.25	0.06	0.50	0.27	0.03	0.95	0.44	0.02	0.59	0.96	0.22
Uniform Delay, d1	50.5	37.0	35.3	59.2	50.9	49.8	55.8	17.0	13.1	53.0	25.5	13.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.02	0.96	0.99	0.91	0.44	0.26
Incremental Delay, d2	90.5	0.3	0.1	22.5	0.9	0.0	64.5	0.7	0.0	0.6	1.8	0.1
Delay (s)	141.0	37.2	35.3	81.7	51.8	49.9	121.3	17.0	13.0	49.1	13.1	3.6
Level of Service	F	D	D	F	D	D	F	B	B	D	B	A
Approach Delay (s)		98.7			52.5			28.6			13.4	
Approach LOS		F			D			C			B	

Intersection Summary			
HCM Average Control Delay	30.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.75	1.00	1.00	0.72	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1393	1863	1583	1342	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	98	53	286	36	14	230	18	609	24	111	1765	22
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	103	56	301	38	15	242	19	641	25	117	1858	23
RTOR Reduction (vph)	0	0	59	0	0	195	0	0	10	0	0	6
Lane Group Flow (vph)	103	56	242	38	15	47	19	641	15	117	1858	17
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	21.9	21.9	21.9	21.9	21.9	21.9	1.9	70.7	70.7	12.6	81.4	81.4
Effective Green, g (s)	23.2	23.2	23.2	23.2	23.2	23.2	2.1	72.0	72.0	12.8	82.7	82.7
Actuated g/C Ratio	0.19	0.19	0.19	0.19	0.19	0.19	0.02	0.60	0.60	0.11	0.69	0.69
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	269	360	306	259	360	306	31	2123	950	189	2439	1091
v/s Ratio Prot		0.03			0.01		0.01	c0.18		0.07	c0.52	
v/s Ratio Perm	0.07		c0.15	0.03		0.03			0.01			0.01
v/c Ratio	0.38	0.16	0.79	0.15	0.04	0.15	0.61	0.30	0.02	0.62	0.76	0.02
Uniform Delay, d1	42.2	40.3	46.1	40.2	39.4	40.2	58.5	11.7	9.7	51.3	12.2	5.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.35	0.08	0.00
Incremental Delay, d2	0.9	0.2	13.0	0.3	0.0	0.2	30.9	0.4	0.0	2.9	1.1	0.0
Delay (s)	43.1	40.5	59.1	40.4	39.4	40.5	89.5	12.1	9.7	72.0	2.2	0.0
Level of Service	D	D	E	D	D	D	F	B	A	E	A	A
Approach Delay (s)		53.3			40.4			14.1			6.2	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.52	1.00	1.00	0.73	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	975	1863	1583	1367	1863	1583
Volume (vph)	104	1056	77	115	2519	58	92	34	286	221	129	319
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	109	1112	81	121	2652	61	97	36	301	233	136	336
RTOR Reduction (vph)	0	0	30	0	0	14	0	0	239	0	0	67
Lane Group Flow (vph)	109	1112	51	121	2652	47	97	36	62	233	136	269
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	6.8	74.4	74.4	12.8	80.4	80.4	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	7.0	75.7	75.7	13.0	81.7	81.7	19.3	19.3	19.3	19.3	19.3	19.3
Actuated g/C Ratio	0.06	0.63	0.63	0.11	0.68	0.68	0.16	0.16	0.16	0.16	0.16	0.16
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	103	2233	999	192	2409	1078	157	300	255	220	300	255
v/s Ratio Prot	c0.06	0.31		0.07	c0.75			0.02			0.07	
v/s Ratio Perm			0.03			0.03	0.10		0.04	c0.17		0.17
v/c Ratio	1.06	0.50	0.05	0.63	1.10	0.04	0.62	0.12	0.24	1.06	0.45	1.05
Uniform Delay, d1	56.5	11.9	8.4	51.2	19.1	6.3	46.9	43.1	44.0	50.3	45.6	50.3
Progression Factor	0.97	0.92	0.84	1.28	0.60	0.13	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	101.8	0.7	0.1	0.6	46.1	0.0	7.1	0.2	0.5	77.1	1.1	71.4
Delay (s)	156.4	11.7	7.2	66.2	57.6	0.8	54.0	43.3	44.5	127.5	46.7	121.7
Level of Service	F	B	A	E	E	A	D	D	D	F	D	F
Approach Delay (s)		23.5			56.8			46.5			109.2	
Approach LOS		C			E			D			F	

Intersection Summary			
HCM Average Control Delay	54.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.04	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	70	3539	3539	1583
Volume (vph)	67	19	14	1170	2925	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	71	20	15	1232	3079	5
RTOR Reduction (vph)	0	9	0	0	0	1
Lane Group Flow (vph)	71	11	15	1232	3079	4
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)	5.3	5.3	105.7	105.7	105.7	105.7
Effective Green, g (s)	5.8	5.8	106.2	106.2	106.2	106.2
Actuated g/C Ratio	0.05	0.05	0.88	0.88	0.88	0.88
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	86	77	62	3132	3132	1401
v/s Ratio Prot	c0.04			0.35	c0.87	
v/s Ratio Perm		0.01	0.21			0.00
v/c Ratio	0.83	0.15	0.24	0.39	0.98	0.00
Uniform Delay, d1	56.6	54.7	1.0	1.2	6.1	0.8
Progression Factor	1.00	1.00	1.00	1.00	1.03	0.38
Incremental Delay, d2	44.9	0.9	9.0	0.4	2.3	0.0
Delay (s)	101.5	55.6	10.0	1.6	8.6	0.3
Level of Service	F	E	B	A	A	A
Approach Delay (s)	91.4			1.7	8.6	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.95						1.00	0.85	1.00	1.00	
Flt Protected		0.97						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1416						2888	1292	1583	1667	
Flt Permitted		0.97						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1416						2888	1292	1583	1667	
Volume (vph)	317	3	162	0	0	0	0	436	250	20	378	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	334	3	171	0	0	0	0	459	263	21	398	0
RTOR Reduction (vph)	0	31	0	0	0	0	0	0	154	0	0	0
Lane Group Flow (vph)	0	477	0	0	0	0	0	459	109	21	398	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	25%	25%	25%	14%	14%	14%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		26.2						28.0	28.0	2.1	34.3	
Effective Green, g (s)		26.8						28.9	28.9	2.3	35.2	
Actuated g/C Ratio		0.38						0.41	0.41	0.03	0.50	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		542						1192	533	52	838	
v/s Ratio Prot		c0.34						0.16		0.01	c0.24	
v/s Ratio Perm									0.08			
v/c Ratio		0.88						0.39	0.20	0.40	0.47	
Uniform Delay, d1		20.1						14.3	13.2	33.2	11.4	
Progression Factor		1.00						1.00	1.00	1.46	0.23	
Incremental Delay, d2		15.0						0.9	0.9	1.3	0.5	
Delay (s)		35.1						15.3	14.0	49.8	3.1	
Level of Service		D						B	B	D	A	
Approach Delay (s)		35.1			0.0			14.8			5.5	
Approach LOS		D			A			B			A	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	124.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.97		1.00	1.00			0.88	
Flt Protected					0.96		0.95	1.00			1.00	
Satd. Flow (prot)					1541		1388	2777			1402	
Flt Permitted					0.96		0.95	1.00			1.00	
Satd. Flow (perm)					1541		1388	2777			1402	
Volume (vph)	0	0	0	309	5	101	202	551	0	0	89	813
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	325	5	106	213	580	0	0	94	856
RTOR Reduction (vph)	0	0	0	0	17	0	0	0	0	0	447	0
Lane Group Flow (vph)	0	0	0	0	419	0	213	580	0	0	503	0
Heavy Vehicles (%)	2%	2%	2%	15%	15%	15%	30%	30%	30%	19%	19%	19%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					18.5		11.0	42.0			26.8	
Effective Green, g (s)					19.1		11.2	42.9			27.7	
Actuated g/C Ratio					0.27		0.16	0.61			0.40	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					420		222	1702			555	
v/s Ratio Prot					c0.27		c0.15	0.21			c0.36	
v/s Ratio Perm												
v/c Ratio					1.00		0.96	0.34			0.91	
Uniform Delay, d1					25.4		29.2	6.6			19.9	
Progression Factor					1.00		0.89	0.98			1.84	
Incremental Delay, d2					43.1		43.1	0.4			2.6	
Delay (s)					68.6		69.1	7.0			39.4	
Level of Service					E		E	A			D	
Approach Delay (s)		0.0			68.6			23.7			39.4	
Approach LOS		A			E			C			D	

Intersection Summary			
HCM Average Control Delay	39.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	124.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		0.97						1.00	0.85	1.00	1.00	
Flt Protected		0.96						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1734						1863	1583	1770	1863	
Flt Permitted		0.96						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1734						1863	1583	1770	1863	
Volume (vph)	720	0	243	0	0	0	0	101	87	860	1229	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	758	0	256	0	0	0	0	106	92	905	1294	0
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	83	0	0	0
Lane Group Flow (vph)	0	1005	0	0	0	0	0	106	9	905	1294	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		58.4						13.1	13.1	54.4	71.7	
Effective Green, g (s)		59.0						14.4	14.4	54.6	73.0	
Actuated g/C Ratio		0.42						0.10	0.10	0.39	0.52	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		731						192	163	690	971	
v/s Ratio Prot		c0.58						0.06		0.51	c0.69	
v/s Ratio Perm									0.01			
v/c Ratio		1.38						0.55	0.06	1.31	1.33	
Uniform Delay, d1		40.5						59.7	56.7	42.7	33.5	
Progression Factor		1.00						1.00	1.00	0.37	0.20	
Incremental Delay, d2		177.5						11.0	0.7	141.2	150.4	
Delay (s)		218.0						70.7	57.4	157.0	157.1	
Level of Service		F						E	E	F	F	
Approach Delay (s)		218.0			0.0			64.5			157.1	
Approach LOS		F			A			E			F	

Intersection Summary			
HCM Average Control Delay	169.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	189.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00		1.00	1.00		1.00	0.89		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1656	3311		1770	3537		1671	2966		1543	2922	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1656	3311		1770	3537		1671	2966		1543	2922	
Volume (vph)	175	439	1	1120	741	3	691	277	836	9	1349	737
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	184	462	1	1179	780	3	727	292	880	9	1420	776
RTOR Reduction (vph)	0	0	0	0	0	0	0	373	0	0	53	0
Lane Group Flow (vph)	184	463	0	1179	783	0	727	799	0	9	2143	0
Heavy Vehicles (%)	9%	9%	9%	2%	2%	2%	8%	8%	8%	17%	17%	17%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	18.1	18.0		33.8	33.7		22.8	68.4		0.8	46.4	
Effective Green, g (s)	18.3	19.3		34.0	35.0		23.0	69.7		1.0	47.7	
Actuated g/C Ratio	0.13	0.14		0.24	0.25		0.16	0.50		0.01	0.34	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	216	456		430	884		275	1477		11	996	
v/s Ratio Prot	0.11	c0.14		c0.67	0.22		c0.43	0.27		0.01	c0.73	
v/s Ratio Perm												
v/c Ratio	0.85	1.02		2.74	0.89		2.64	0.54		0.82	2.15	
Uniform Delay, d1	59.5	60.4		53.0	50.6		58.5	24.2		69.4	46.2	
Progression Factor	0.97	0.97		1.00	1.00		1.13	0.97		1.00	1.00	
Incremental Delay, d2	24.3	44.2		790.4	10.6		740.6	0.1		167.9	521.7	
Delay (s)	82.0	102.5		843.4	61.2		806.5	23.5		237.3	567.8	
Level of Service	F	F		F	E		F	C		F	F	
Approach Delay (s)		96.7			531.2			323.3			566.5	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	442.1	HCM Level of Service	F
HCM Volume to Capacity ratio	2.16		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	186.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.89		1.00	1.00			1.00	0.85
Flt Protected					0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1638		1770	1863			1863	1583
Flt Permitted					0.99		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1638		1770	1863			1863	1583
Volume (vph)	0	0	0	200	0	1056	10	811	0	0	1889	1030
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	211	0	1112	11	854	0	0	1988	1084
RTOR Reduction (vph)	0	0	0	0	98	0	0	0	0	0	0	160
Lane Group Flow (vph)	0	0	0	0	1225	0	11	854	0	0	1988	924
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					54.5		1.7	75.6			69.7	69.7
Effective Green, g (s)					55.1		1.9	76.9			71.0	71.0
Actuated g/C Ratio					0.39		0.01	0.55			0.51	0.51
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					645		24	1023			945	803
v/s Ratio Prot					c0.75		0.01	c0.46			c1.07	
v/s Ratio Perm												0.58
v/c Ratio					1.90		0.46	0.83			2.10	1.15
Uniform Delay, d1					42.4		68.5	26.3			34.5	34.5
Progression Factor					1.00		1.21	1.32			0.32	0.21
Incremental Delay, d2					410.7		1.3	0.8			497.0	69.2
Delay (s)					453.2		84.1	35.4			508.2	76.4
Level of Service					F		F	D			F	E
Approach Delay (s)		0.0			453.2			36.0			355.8	
Approach LOS		A			F			D			F	

Intersection Summary			
HCM Average Control Delay	327.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.95		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	189.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3496	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3496	
Volume (vph)	147	285	304	629	110	78	63	250	141	163	877	77
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	155	300	320	662	116	82	66	263	148	172	923	81
RTOR Reduction (vph)	0	0	119	0	0	73	0	0	115	0	6	0
Lane Group Flow (vph)	155	300	201	662	116	9	66	263	33	172	998	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	29.7	18.8	18.8	21.9	11.0	11.0	5.3	22.0	22.0	20.5	37.2	
Effective Green, g (s)	29.9	19.0	19.0	22.1	11.2	11.2	5.5	22.2	22.2	20.7	37.4	
Actuated g/C Ratio	0.30	0.19	0.19	0.22	0.11	0.11	0.06	0.22	0.22	0.21	0.37	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	529	354	301	759	209	177	97	414	351	366	1308	
v/s Ratio Prot	0.09	c0.16		c0.19	0.06		0.04	c0.14		0.10	c0.29	
v/s Ratio Perm			0.13			0.01			0.02			
v/c Ratio	0.29	0.85	0.67	0.87	0.56	0.05	0.68	0.64	0.09	0.47	0.76	
Uniform Delay, d1	26.9	39.1	37.6	37.6	42.0	39.7	46.4	35.2	30.9	34.8	27.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.69	
Incremental Delay, d2	0.3	16.9	5.5	10.8	3.2	0.1	17.9	7.3	0.5	0.7	3.0	
Delay (s)	27.2	56.0	43.1	48.4	45.2	39.8	64.2	42.5	31.4	26.5	21.8	
Level of Service	C	E	D	D	D	D	E	D	C	C	C	
Approach Delay (s)		44.9			47.1			42.1			22.5	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	37.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	182	384	733	85	130	344
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	192	404	772	89	137	362
RTOR Reduction (vph)	0	335	0	0	0	76
Lane Group Flow (vph)	192	69	772	89	137	286
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	15.1	15.1	60.5	79.8	11.8	72.3
Effective Green, g (s)	15.3	15.3	60.7	80.0	12.0	72.7
Actuated g/C Ratio	0.15	0.15	0.61	0.80	0.12	0.73
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	285	242	1074	1490	212	1214
v/s Ratio Prot	c0.10		c0.44	0.05	c0.08	0.14
v/s Ratio Perm		0.04				0.04
v/c Ratio	0.67	0.28	0.72	0.06	0.65	0.24
Uniform Delay, d1	40.0	37.5	13.7	2.1	42.0	4.5
Progression Factor	1.00	1.00	0.68	0.33	0.67	1.06
Incremental Delay, d2	6.2	0.6	3.9	0.1	6.0	0.1
Delay (s)	46.1	38.1	13.1	0.8	34.1	4.9
Level of Service	D	D	B	A	C	A
Approach Delay (s)	40.7			11.8	12.9	
Approach LOS	D			B	B	

Intersection Summary			
HCM Average Control Delay	20.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	91	434	592	62	206	345
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	96	457	623	65	217	363
RTOR Reduction (vph)	0	0	0	25	0	301
Lane Group Flow (vph)	96	457	623	40	217	62
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	9.4	74.6	61.0	61.0	17.0	17.0
Effective Green, g (s)	9.6	74.8	61.2	61.2	17.2	17.2
Actuated g/C Ratio	0.10	0.75	0.61	0.61	0.17	0.17
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	170	2647	2166	969	304	272
v/s Ratio Prot	c0.05	0.13	c0.18		c0.12	
v/s Ratio Perm				0.03		0.04
v/c Ratio	0.56	0.17	0.29	0.04	0.71	0.23
Uniform Delay, d1	43.2	3.6	9.1	7.7	39.1	35.7
Progression Factor	0.63	0.24	0.41	0.14	1.00	1.00
Incremental Delay, d2	3.9	0.1	0.3	0.1	7.7	0.4
Delay (s)	31.0	1.0	4.0	1.1	46.8	36.1
Level of Service	C	A	A	A	D	D
Approach Delay (s)		6.2	3.7		40.1	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	29	1016	1061	47	133	97
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	1069	1117	49	140	102
RTOR Reduction (vph)	0	0	0	14	0	89
Lane Group Flow (vph)	31	1069	1117	35	140	13
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	3.4	78.9	71.3	71.3	12.7	12.7
Effective Green, g (s)	3.6	79.1	71.5	71.5	12.9	12.9
Actuated g/C Ratio	0.04	0.79	0.72	0.72	0.13	0.13
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	64	2799	2530	1132	228	204
v/s Ratio Prot	0.02	c0.30	c0.32			
v/s Ratio Perm				0.02	c0.08	0.01
v/c Ratio	0.48	0.38	0.44	0.03	0.61	0.06
Uniform Delay, d1	47.3	3.1	5.9	4.2	41.2	38.3
Progression Factor	0.95	1.14	0.56	0.12	1.00	1.00
Incremental Delay, d2	5.6	0.4	0.5	0.0	4.8	0.1
Delay (s)	50.5	4.0	3.8	0.5	46.0	38.4
Level of Service	D	A	A	A	D	D
Approach Delay (s)		5.3	3.7		42.8	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3498		1770	3537		1770	1723		1770	1591	
Flt Permitted	0.95	1.00		0.95	1.00		0.43	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3498		1770	3537		799	1723		1399	1591	
Volume (vph)	57	1058	88	5	981	5	119	5	5	5	5	172
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	60	1114	93	5	1033	5	125	5	5	5	5	181
RTOR Reduction (vph)	0	4	0	0	0	0	0	4	0	0	150	0
Lane Group Flow (vph)	60	1203	0	5	1038	0	125	6	0	5	36	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	7.1	68.7		2.0	63.6		16.7	16.7		16.7	16.7	
Effective Green, g (s)	7.3	68.9		2.2	63.8		16.9	16.9		16.9	16.9	
Actuated g/C Ratio	0.07	0.69		0.02	0.64		0.17	0.17		0.17	0.17	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	129	2410		39	2257		135	291		236	269	
v/s Ratio Prot	0.03	c0.34		0.00	c0.29			0.00			0.02	
v/s Ratio Perm							c0.16			0.00		
v/c Ratio	0.47	0.50		0.13	0.46		0.93	0.02		0.02	0.13	
Uniform Delay, d1	44.5	7.4		48.0	9.3		40.9	34.6		34.7	35.3	
Progression Factor	0.84	0.88		0.88	0.69		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.5	0.7		1.4	0.7		54.9	0.0		0.0	0.2	
Delay (s)	39.8	7.2		43.5	7.1		95.8	34.7		34.7	35.5	
Level of Service	D	A		D	A		F	C		C	D	
Approach Delay (s)		8.7			7.3			91.3			35.5	
Approach LOS		A			A			F			D	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.87		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3458		1770	3532		1770	1618		1770	1662	
Flt Permitted	0.95	1.00		0.95	1.00		0.41	1.00		0.74	1.00	
Satd. Flow (perm)	1770	3458		1770	3532		766	1618		1372	1662	
Volume (vph)	59	750	135	139	333	5	196	4	27	5	67	173
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	62	789	142	146	351	5	206	4	28	5	71	182
RTOR Reduction (vph)	0	12	0	0	1	0	0	21	0	0	108	0
Lane Group Flow (vph)	62	919	0	146	355	0	206	11	0	5	145	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	7.0	48.5		13.4	54.9		25.5	25.5		25.5	25.5	
Effective Green, g (s)	7.2	48.7		13.6	55.1		25.7	25.7		25.7	25.7	
Actuated g/C Ratio	0.07	0.49		0.14	0.55		0.26	0.26		0.26	0.26	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	1684		241	1946		197	416		353	427	
v/s Ratio Prot	0.04	c0.27		c0.08	0.10			0.01			0.09	
v/s Ratio Perm							c0.27			0.00		
v/c Ratio	0.49	0.55		0.61	0.18		1.05	0.03		0.01	0.34	
Uniform Delay, d1	44.6	17.9		40.7	11.2		37.2	27.8		27.7	30.2	
Progression Factor	0.88	0.62		0.57	0.31		0.94	0.94		1.00	1.00	
Incremental Delay, d2	2.6	1.1		3.9	0.2		76.6	0.0		0.0	0.5	
Delay (s)	42.1	12.3		27.0	3.7		111.6	26.1		27.7	30.7	
Level of Service	D	B		C	A		F	C		C	C	
Approach Delay (s)		14.2			10.5			100.1			30.6	
Approach LOS		B			B			F			C	

Intersection Summary			
HCM Average Control Delay	25.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.86	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3448		1770	1520	1504	1770	1589	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.32	1.00	1.00	0.71	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3448		601	1520	1504	1323	1589	
Volume (vph)	57	624	148	1643	414	86	57	4	122	77	4	174
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	60	657	156	1729	436	91	60	4	128	81	4	183
RTOR Reduction (vph)	0	0	80	0	28	0	0	56	56	0	160	0
Lane Group Flow (vph)	60	657	76	1729	499	0	60	12	8	81	27	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	37.6	19.6	19.6	55.6	37.6		12.2	12.2	12.2	12.2	12.2	
Effective Green, g (s)	37.8	19.8	19.8	55.8	37.8		12.4	12.4	12.4	12.4	12.4	
Actuated g/C Ratio	0.38	0.20	0.20	0.56	0.38		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	669	701	313	1916	1303		75	188	186	164	197	
v/s Ratio Prot	0.03	c0.19		c0.50	0.14			0.01			0.02	
v/s Ratio Perm			0.05				c0.10		0.01	0.06		
v/c Ratio	0.09	0.94	0.24	0.90	0.38		0.80	0.06	0.04	0.49	0.14	
Uniform Delay, d1	20.0	39.5	33.8	19.7	22.6		42.6	38.7	38.6	40.9	39.0	
Progression Factor	0.22	0.65	0.60	0.88	0.86		0.76	0.86	0.90	1.00	1.00	
Incremental Delay, d2	0.1	18.3	0.4	5.0	0.5		43.8	0.1	0.1	2.3	0.3	
Delay (s)	4.5	43.9	20.7	22.2	20.0		76.2	33.3	34.7	43.2	39.3	
Level of Service	A	D	C	C	B		E	C	C	D	D	
Approach Delay (s)		37.1			21.7			47.1			40.5	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	28.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3538		1770	1515	1504	1770	1633	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.74	1.00	1.00	0.46	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3538		1377	1515	1504	856	1633	
Volume (vph)	7	797	19	859	2083	4	43	5	231	14	5	22
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	7	839	20	904	2193	4	45	5	243	15	5	23
RTOR Reduction (vph)	0	0	7	0	0	0	0	110	111	0	21	0
Lane Group Flow (vph)	7	839	13	904	2197	0	45	16	11	15	7	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	1.4	41.2	41.2	37.7	77.5		8.5	8.5	8.5	8.5	8.5	
Effective Green, g (s)	1.6	41.4	41.4	37.9	77.7		8.7	8.7	8.7	8.7	8.7	
Actuated g/C Ratio	0.02	0.41	0.41	0.38	0.78		0.09	0.09	0.09	0.09	0.09	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	28	1465	655	1301	2749		120	132	131	74	142	
v/s Ratio Prot	0.00	0.24		c0.26	c0.62			0.01			0.00	
v/s Ratio Perm			0.01				c0.03		0.01	0.02		
v/c Ratio	0.25	0.57	0.02	0.69	0.80		0.38	0.12	0.08	0.20	0.05	
Uniform Delay, d1	48.6	22.5	17.3	26.2	6.6		43.1	42.1	42.0	42.4	41.9	
Progression Factor	1.00	0.14	0.01	1.00	1.00		1.05	1.17	1.20	1.00	1.00	
Incremental Delay, d2	2.5	0.3	0.0	3.1	2.5		2.0	0.4	0.3	1.4	0.1	
Delay (s)	51.1	3.3	0.1	29.3	9.1		47.1	49.7	50.8	43.8	42.0	
Level of Service	D	A	A	C	A		D	D	D	D	D	
Approach Delay (s)		3.7			15.0			49.8			42.6	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑		↱
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1011	31	0	2944	0	121
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	1064	33	0	3099	0	127
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.82		0.82	0.82
vC, conflicting volume			1097		2614	532
vC1, stage 1 conf vol					1064	
vC2, stage 2 conf vol					1549	
vCu, unblocked vol			903		2745	217
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	91
cM capacity (veh/h)			616		102	1430

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	532	532	33	1549	1549	127
Volume Left	0	0	0	0	0	0
Volume Right	0	0	33	0	0	127
cSH	1700	1700	1700	1700	1700	1430
Volume to Capacity	0.31	0.31	0.02	0.91	0.91	0.09
Queue Length 95th (ft)	0	0	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	7.8
Lane LOS						A
Approach Delay (s)	0.0			0.0		7.8
Approach LOS						A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.87		1.00	0.94		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1610		1770	1624		1770	3327		1770	3539	
Flt Permitted	0.73	1.00		0.72	1.00		0.09	1.00		0.61	1.00	
Satd. Flow (perm)	1369	1610		1346	1624		175	3327		1144	3539	
Volume (vph)	30	5	46	109	5	28	38	125	84	77	1717	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	5	48	115	5	29	40	132	88	81	1807	1
RTOR Reduction (vph)	0	27	0	0	25	0	0	19	0	0	0	0
Lane Group Flow (vph)	32	26	0	115	9	0	40	201	0	81	1808	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.4	13.4		13.4	13.4		78.2	78.2		78.2	78.2	
Effective Green, g (s)	13.6	13.6		13.6	13.6		78.4	78.4		78.4	78.4	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.78	0.78		0.78	0.78	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	186	219		183	221		137	2608		897	2775	
v/s Ratio Prot		0.02			0.01			0.06			c0.51	
v/s Ratio Perm	0.02			c0.09			0.23			0.07		
v/c Ratio	0.17	0.12		0.63	0.04		0.29	0.08		0.09	0.65	
Uniform Delay, d1	38.2	37.9		40.8	37.5		3.0	2.5		2.5	4.8	
Progression Factor	1.00	1.00		1.00	1.00		1.83	0.05		0.06	0.13	
Incremental Delay, d2	0.4	0.2		6.6	0.1		5.3	0.1		0.1	0.6	
Delay (s)	38.7	38.2		47.4	37.6		10.8	0.2		0.2	1.2	
Level of Service	D	D		D	D		B	A		A	A	
Approach Delay (s)		38.4			45.2			1.8			1.2	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	399	1056	824	118	164	19
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	420	1112	867	124	173	20
RTOR Reduction (vph)	0	4	0	0	0	11
Lane Group Flow (vph)	420	1108	867	124	173	9
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	16.0	60.6	26.8	47.0	44.6	44.6
Effective Green, g (s)	16.2	61.0	27.0	47.2	44.8	44.8
Actuated g/C Ratio	0.16	0.61	0.27	0.47	0.45	0.45
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	573	1029	927	1670	793	709
v/s Ratio Prot	0.12	c0.48	c0.25	0.04	0.10	
v/s Ratio Perm		0.22				0.01
v/c Ratio	0.73	1.08	0.94	0.07	0.22	0.01
Uniform Delay, d1	39.8	19.5	35.6	14.4	16.9	15.3
Progression Factor	1.00	1.00	0.87	0.78	0.75	0.78
Incremental Delay, d2	4.8	51.3	14.7	0.0	0.6	0.0
Delay (s)	44.7	70.8	45.7	11.3	13.4	11.9
Level of Service	D	E	D	B	B	B
Approach Delay (s)	63.6			41.4	13.2	
Approach LOS	E			D	B	

Intersection Summary			
HCM Average Control Delay	51.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1858		1770	1859		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1858		1770	1859		1770	1863	1583
Volume (vph)	18	333	172	50	352	7	36	75	1	33	389	437
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	19	351	181	53	371	7	38	79	1	35	409	460
RTOR Reduction (vph)	0	0	76	0	1	0	0	1	0	0	0	229
Lane Group Flow (vph)	19	351	105	53	377	0	38	79	0	35	409	231
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	3.9	43.2	43.2	8.7	48.0		4.8	14.6		16.7	26.5	26.5
Effective Green, g (s)	4.1	43.4	43.4	8.9	48.2		5.0	14.8		16.9	26.7	26.7
Actuated g/C Ratio	0.04	0.43	0.43	0.09	0.48		0.05	0.15		0.17	0.27	0.27
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	73	809	687	158	896		89	275		299	497	423
v/s Ratio Prot	0.01	0.19		c0.03	c0.20		c0.02	0.04		0.02	c0.22	
v/s Ratio Perm			0.07									0.15
v/c Ratio	0.26	0.43	0.15	0.34	0.42		0.43	0.29		0.12	0.82	0.55
Uniform Delay, d1	46.5	19.7	17.2	42.8	16.8		46.1	37.9		35.2	34.4	31.5
Progression Factor	0.63	0.25	0.00	0.96	1.01		0.58	0.65		1.05	1.01	1.12
Incremental Delay, d2	1.6	1.4	0.4	1.1	1.3		3.0	0.5		0.2	10.4	1.4
Delay (s)	31.0	6.3	0.4	42.2	18.3		30.0	25.3		37.1	45.2	36.7
Level of Service	C	A	A	D	B		C	C		D	D	D
Approach Delay (s)		5.2			21.2			26.8			40.6	
Approach LOS		A			C			C			D	

Intersection Summary			
HCM Average Control Delay	25.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1852		1770	3520		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1852		1770	3520		1770	3539	1583
Volume (vph)	47	25	295	139	24	1	82	359	13	2	1742	303
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	49	26	311	146	25	1	86	378	14	2	1834	319
RTOR Reduction (vph)	0	0	73	0	1	0	0	3	0	0	0	39
Lane Group Flow (vph)	49	26	238	146	25	0	86	389	0	2	1834	280
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	19.8	20.1	20.1	8.6	8.9		8.7	49.6		4.9	45.8	45.8
Effective Green, g (s)	20.0	20.3	20.3	8.8	9.1		8.9	49.8		5.1	46.0	46.0
Actuated g/C Ratio	0.20	0.20	0.20	0.09	0.09		0.09	0.50		0.05	0.46	0.46
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	354	378	321	156	169		158	1753		90	1628	728
v/s Ratio Prot	0.03	0.01		c0.08	0.01		c0.05	0.11		0.00	c0.52	
v/s Ratio Perm			c0.15									0.18
v/c Ratio	0.14	0.07	0.74	0.94	0.15		0.54	0.22		0.02	1.13	0.38
Uniform Delay, d1	32.9	32.2	37.4	45.3	41.9		43.6	14.2		45.1	27.0	17.7
Progression Factor	0.28	0.30	0.18	1.00	1.00		0.98	0.33		0.70	0.52	0.36
Incremental Delay, d2	0.2	0.1	8.5	52.8	0.4		2.0	0.2		0.1	64.1	1.3
Delay (s)	9.5	9.7	15.3	98.1	42.3		44.7	4.9		31.7	78.2	7.6
Level of Service	A	A	B	F	D		D	A		C	E	A
Approach Delay (s)		14.2			89.7			12.0			67.7	
Approach LOS		B			F			B			E	

Intersection Summary			
HCM Average Control Delay	54.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	20	19	3	3	67	60	5	7	187	6	102
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	21	20	3	3	71	63	5	7	197	6	107
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	74			41			162	122	31	86	96	38
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	74			41			162	122	31	86	96	38
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			91	99	99	78	99	90
cM capacity (veh/h)	1526			1568			713	765	1043	885	789	1033

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	41	3	74	76	311
Volume Left	5	0	3	0	63	197
Volume Right	0	20	0	71	7	107
cSH	1526	1700	1568	1700	739	929
Volume to Capacity	0.00	0.02	0.00	0.04	0.10	0.33
Queue Length 95th (ft)	0	0	0	0	9	37
Control Delay (s)	7.4	0.0	7.3	0.0	10.4	10.8
Lane LOS	A		A		B	B
Approach Delay (s)	0.8		0.3		10.4	10.8
Approach LOS					B	B

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	172	82	518	80	44	5	141	896	157	5	1673	236
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	181	86	545	84	46	5	148	943	165	5	1761	248
RTOR Reduction (vph)	0	0	423	0	0	5	0	0	68	0	0	81
Lane Group Flow (vph)	181	86	123	84	46	0	148	943	97	5	1761	167
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	18.7	15.3	15.3	8.7	5.3	5.3	13.7	58.4	58.4	0.8	45.5	45.5
Effective Green, g (s)	18.9	15.5	15.5	8.9	5.5	5.5	13.9	58.6	58.6	1.0	45.7	45.7
Actuated g/C Ratio	0.19	0.16	0.16	0.09	0.06	0.06	0.14	0.59	0.59	0.01	0.46	0.46
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	335	289	245	158	102	87	477	2074	928	18	1617	723
v/s Ratio Prot	c0.10	0.05		c0.05	0.02		0.04	c0.27		0.00	c0.50	
v/s Ratio Perm			0.08			0.00			0.06			0.11
v/c Ratio	0.54	0.30	0.50	0.53	0.45	0.00	0.31	0.45	0.10	0.28	1.09	0.23
Uniform Delay, d1	36.6	37.4	38.7	43.6	45.8	44.7	38.7	11.7	9.1	49.1	27.1	16.5
Progression Factor	1.05	1.04	1.46	1.00	1.00	1.00	1.00	1.00	1.00	1.08	0.59	0.22
Incremental Delay, d2	0.2	0.1	0.1	3.4	3.1	0.0	0.4	0.7	0.2	5.9	48.2	0.5
Delay (s)	38.7	39.1	56.6	47.0	48.9	44.7	39.1	12.4	9.4	59.0	64.1	4.1
Level of Service	D	D	E	D	D	D	D	B	A	E	E	A
Approach Delay (s)		50.7			47.6			15.1			56.7	
Approach LOS		D			D			B			E	

Intersection Summary			
HCM Average Control Delay	42.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4981		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.57	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	4981		3433	5085	1583	1054	1863	1583	1405	1863	1583
Volume (vph)	89	956	151	429	1900	27	17	5	34	114	140	405
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	94	1006	159	452	2000	28	18	5	36	120	147	426
RTOR Reduction (vph)	0	21	0	0	0	8	0	0	29	0	0	161
Lane Group Flow (vph)	94	1144	0	452	2000	20	18	5	7	120	147	265
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	8.0	39.5		27.4	58.9	58.9	20.5	20.5	20.5	20.5	20.5	20.5
Effective Green, g (s)	8.2	39.7		27.6	59.1	59.1	20.7	20.7	20.7	20.7	20.7	20.7
Actuated g/C Ratio	0.08	0.40		0.28	0.59	0.59	0.21	0.21	0.21	0.21	0.21	0.21
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	145	1977		948	3005	936	218	386	328	291	386	328
v/s Ratio Prot	0.05	c0.23		0.13	c0.39			0.00			0.08	
v/s Ratio Perm						0.01	0.02		0.00	0.09		c0.17
v/c Ratio	0.65	0.58		0.48	0.67	0.02	0.08	0.01	0.02	0.41	0.38	0.81
Uniform Delay, d1	44.5	23.6		30.2	13.8	8.5	32.0	31.5	31.6	34.4	34.1	37.8
Progression Factor	1.00	0.75		0.74	0.59	0.60	1.00	1.00	1.00	0.91	0.92	1.04
Incremental Delay, d2	9.0	1.2		0.2	0.6	0.0	0.2	0.0	0.0	0.8	0.5	11.5
Delay (s)	53.3	18.8		22.4	8.8	5.1	32.2	31.5	31.6	32.2	32.0	50.8
Level of Service	D	B		C	A	A	C	C	C	C	C	D
Approach Delay (s)		21.4			11.2			31.8			43.6	
Approach LOS		C			B			C			D	

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5039		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5039		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	333	533	34	984	1887	122	29	9	61	442	310	925
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	351	561	36	1036	1986	128	31	9	64	465	326	974
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	37	0	0	103
Lane Group Flow (vph)	351	589	0	1036	1986	128	31	9	27	465	326	871
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	8.8	15.3		38.6	45.1	100.0	3.5	2.9	41.5	26.4	25.8	34.6
Effective Green, g (s)	9.0	15.5		38.8	45.3	100.0	3.7	3.1	41.9	26.6	26.0	35.0
Actuated g/C Ratio	0.09	0.16		0.39	0.45	1.00	0.04	0.03	0.42	0.27	0.26	0.35
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	309	781		1332	2304	1583	65	58	1279	471	484	975
v/s Ratio Prot	c0.10	0.12		0.30	c0.39		0.02	0.00	0.01	c0.26	0.18	c0.08
v/s Ratio Perm						0.08			0.00			0.23
v/c Ratio	1.14	0.75		0.78	0.86	0.08	0.48	0.16	0.02	0.99	0.67	0.89
Uniform Delay, d1	45.5	40.4		26.8	24.5	0.0	47.2	47.2	17.0	36.5	33.2	30.7
Progression Factor	0.76	0.74		0.73	0.63	1.00	1.00	1.00	1.00	0.64	0.66	0.52
Incremental Delay, d2	89.5	5.7		1.8	2.8	0.1	5.4	1.2	0.0	18.3	1.0	3.2
Delay (s)	123.9	35.5		21.4	18.3	0.1	52.6	48.4	17.0	41.5	22.8	19.1
Level of Service	F	D		C	B	A	D	D	B	D	C	B
Approach Delay (s)		68.2			18.6			30.4			25.7	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM Average Control Delay	28.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4949		1770	5065		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.36	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	1770	4949		1770	5065		667	1863	1583	1405	1863	1583
Volume (vph)	8	560	122	720	2873	79	13	5	77	18	189	56
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	589	128	758	3024	83	14	5	81	19	199	59
RTOR Reduction (vph)	0	31	0	0	2	0	0	0	69	0	0	50
Lane Group Flow (vph)	8	686	0	758	3105	0	14	5	12	19	199	9
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	0.8	27.3		45.2	71.7		14.9	14.9	14.9	14.9	14.9	14.9
Effective Green, g (s)	1.0	27.5		45.4	71.9		15.1	15.1	15.1	15.1	15.1	15.1
Actuated g/C Ratio	0.01	0.28		0.45	0.72		0.15	0.15	0.15	0.15	0.15	0.15
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	18	1361		804	3642		101	281	239	212	281	239
v/s Ratio Prot	0.00	c0.14		c0.43	c0.61			0.00			c0.11	
v/s Ratio Perm							0.02		0.01	0.01		0.01
v/c Ratio	0.44	0.50		0.94	0.85		0.14	0.02	0.05	0.09	0.71	0.04
Uniform Delay, d1	49.2	30.5		26.1	10.2		36.8	36.1	36.3	36.5	40.4	36.2
Progression Factor	0.64	0.47		1.00	1.00		1.00	1.00	1.00	0.96	0.97	0.92
Incremental Delay, d2	10.9	0.9		19.1	2.7		0.6	0.0	0.1	0.2	7.9	0.1
Delay (s)	42.4	15.2		45.2	12.9		37.4	36.2	36.4	35.4	47.1	33.4
Level of Service	D	B		D	B		D	D	D	D	D	C
Approach Delay (s)		15.5			19.3			36.5			43.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.94	0.91	1.00	1.00	0.91	0.88	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	4990	5085	1583	1770	5085	2787	4990	5085	1583
Volume (vph)	946	1893	93	933	1339	675	43	1657	2504	428	579	449
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	996	1993	98	982	1409	711	45	1744	2636	451	609	473
RTOR Reduction (vph)	0	0	16	0	0	77	0	0	0	0	0	323
Lane Group Flow (vph)	996	1993	82	982	1409	634	45	1744	2636	451	609	150
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	32.8	39.9	39.9	42.8	49.9	49.9	6.5	37.5	80.3	10.8	41.8	41.8
Effective Green, g (s)	33.0	41.2	41.2	43.0	51.2	51.2	6.7	38.8	81.8	11.0	43.1	43.1
Actuated g/C Ratio	0.22	0.27	0.27	0.29	0.34	0.34	0.04	0.26	0.55	0.07	0.29	0.29
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	755	1397	435	1430	1736	540	79	1315	1520	366	1461	455
v/s Ratio Prot	0.29	c0.39		0.20	0.28		0.03	0.34	c0.50	c0.09	0.12	
v/s Ratio Perm			0.05			0.40			0.45			0.09
v/c Ratio	1.32	1.43	0.19	0.69	0.81	1.17	0.57	1.33	1.73	1.23	0.42	0.33
Uniform Delay, d1	58.5	54.4	41.6	47.5	45.0	49.4	70.2	55.6	34.1	69.5	43.3	42.1
Progression Factor	0.71	0.95	0.97	1.20	0.64	0.58	1.19	0.96	0.91	1.00	1.00	1.00
Incremental Delay, d2	144.5	192.4	0.1	0.8	2.4	89.2	4.6	149.5	331.8	126.1	0.2	0.4
Delay (s)	185.9	244.0	40.4	57.6	31.2	118.0	88.1	203.1	363.0	195.6	43.5	42.5
Level of Service	F	F	D	E	C	F	F	F	F	F	D	D
Approach Delay (s)		218.8			59.5			297.1			87.9	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	190.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.60		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	142.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0		4.0
Lane Util. Factor		0.86	0.86		0.86	0.86				0.97		0.88
Frt		0.97	0.85		1.00	0.85				1.00		0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (prot)		4583	1335		4497	1274				3303		2682
Flt Permitted		1.00	1.00		1.00	1.00				0.95		1.00
Satd. Flow (perm)		4583	1335		4497	1274				3303		2682
Volume (vph)	0	3022	2333	0	1451	262	0	0	0	265	0	1173
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3181	2456	0	1527	276	0	0	0	279	0	1235
RTOR Reduction (vph)	0	22	0	0	0	0	0	0	0	0	0	52
Lane Group Flow (vph)	0	3882	1733	0	1527	276	0	0	0	279	0	1184
Heavy Vehicles (%)	4%	4%	4%	9%	9%	9%	2%	2%	2%	6%	6%	6%
Turn Type			Free			Free				custom		custom
Protected Phases		4			8							
Permitted Phases			Free			Free				6		6
Actuated Green, G (s)		93.7	150.0		93.7	150.0				46.4		46.4
Effective Green, g (s)		95.0	150.0		95.0	150.0				47.0		47.0
Actuated g/C Ratio		0.63	1.00		0.63	1.00				0.31		0.31
Clearance Time (s)		5.3			5.3					4.6		4.6
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		2903	1335		2848	1274				1035		840
v/s Ratio Prot		0.85			0.34							
v/s Ratio Perm			c1.30			0.22				0.08		0.44
v/c Ratio		1.34	1.30		0.54	0.22				0.27		1.41
Uniform Delay, d1		27.5	75.0		15.3	0.0				38.6		51.5
Progression Factor		0.88	1.00		0.73	1.00				1.00		1.00
Incremental Delay, d2		152.0	134.7		0.4	0.2				0.1		191.1
Delay (s)		176.2	209.7		11.5	0.2				38.8		242.6
Level of Service		F	F		B	A				D		F
Approach Delay (s)		186.5			9.8			0.0			205.1	
Approach LOS		F			A			A			F	

Intersection Summary			
HCM Average Control Delay	154.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	0.95			0.86	0.86	0.95	0.95	0.88			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3303	3406			4456	1263	1588	1593	2632			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3303	3406			4456	1263	1588	1593	2632			
Volume (vph)	1103	2184	0	0	1100	378	613	5	1261	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1161	2299	0	0	1158	398	645	5	1327	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	234	0	0	3	0	0	0
Lane Group Flow (vph)	1161	2299	0	0	1158	164	323	327	1324	0	0	0
Heavy Vehicles (%)	6%	6%	6%	10%	10%	10%	8%	8%	8%	2%	2%	2%
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	40.8	80.7			36.4	36.4	59.4	59.4	59.4			
Effective Green, g (s)	41.0	82.0			37.0	37.0	60.0	60.0	60.0			
Actuated g/C Ratio	0.27	0.55			0.25	0.25	0.40	0.40	0.40			
Clearance Time (s)	4.2	5.3			4.6	4.6	4.6	4.6	4.6			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	903	1862			1099	312	635	637	1053			
v/s Ratio Prot	0.35	c0.68			0.26		0.20	0.21				
v/s Ratio Perm						0.13			c0.50			
v/c Ratio	1.29	1.23			1.05	0.52	0.51	0.51	1.26			
Uniform Delay, d1	54.5	34.0			56.5	48.9	33.9	34.0	45.0			
Progression Factor	0.75	0.59			0.42	0.44	1.00	1.00	1.00			
Incremental Delay, d2	129.4	106.1			38.4	4.4	0.6	0.7	123.6			
Delay (s)	170.0	126.2			62.2	25.7	34.5	34.7	168.6			
Level of Service	F	F			E	C	C	C	F			
Approach Delay (s)		140.9			52.9			124.6			0.0	
Approach LOS		F			D			F			A	

Intersection Summary			
HCM Average Control Delay	116.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.95		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	4803	1495	1687	4758		3183	1639		1626	3215	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	4803	1495	1687	4758		3183	1639		1626	3215	
Volume (vph)	257	2084	776	157	983	139	303	404	210	156	492	41
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	271	2194	817	165	1035	146	319	425	221	164	518	43
RTOR Reduction (vph)	0	0	238	0	13	0	0	13	0	0	5	0
Lane Group Flow (vph)	271	2194	579	165	1168	0	319	633	0	164	556	0
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	10%	10%	10%	11%	11%	11%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	28.9	58.4	58.4	12.8	42.3		30.6	47.7		12.8	30.6	
Effective Green, g (s)	29.1	59.0	59.0	13.0	42.9		30.8	49.0		13.0	31.2	
Actuated g/C Ratio	0.19	0.39	0.39	0.09	0.29		0.21	0.33		0.09	0.21	
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6		4.2	5.3		4.2	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	324	1889	588	146	1361		654	535		141	669	
v/s Ratio Prot	0.16	c0.46		c0.10	0.25		0.10	c0.39		c0.10	0.17	
v/s Ratio Perm			0.39									
v/c Ratio	0.84	1.16	0.98	1.13	0.86		0.49	1.18		1.16	0.83	
Uniform Delay, d1	58.2	45.5	45.0	68.5	50.7		52.6	50.5		68.5	56.9	
Progression Factor	1.00	1.00	1.01	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	73.3	8.0	113.7	7.2		0.6	100.4		126.3	8.7	
Delay (s)	60.2	118.9	53.6	182.2	57.9		53.2	150.9		194.8	65.6	
Level of Service	E	F	D	F	E		D	F		F	E	
Approach Delay (s)		97.8			73.1			118.6			94.8	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	95.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	105.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	3539	1583	1770	3539	1583
Volume (vph)	254	73	118	44	187	157	96	2545	19	84	963	319
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	267	77	124	46	197	165	101	2679	20	88	1014	336
RTOR Reduction (vph)	0	0	108	0	0	124	0	0	4	0	0	181
Lane Group Flow (vph)	267	77	16	46	197	41	101	2679	16	88	1014	155
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	19.2	17.8	17.8	18.8	17.4	17.4	26.4	87.6	87.6	6.8	68.0	68.0
Effective Green, g (s)	19.4	19.1	19.1	19.0	18.7	18.7	26.6	88.9	88.9	7.0	69.3	69.3
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.12	0.12	0.18	0.59	0.59	0.05	0.46	0.46
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	229	237	202	224	232	347	314	2097	938	83	1635	731
v/s Ratio Prot	c0.15	0.04		0.03	c0.11		0.06	c0.76		c0.05	0.29	
v/s Ratio Perm			0.01			0.01			0.01			0.10
v/c Ratio	1.17	0.32	0.08	0.21	0.85	0.12	0.32	1.28	0.02	1.06	0.62	0.21
Uniform Delay, d1	65.3	59.6	57.7	58.7	64.3	58.3	53.8	30.6	12.6	71.5	30.4	24.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.43	0.20	0.95	1.00	4.38
Incremental Delay, d2	111.6	0.8	0.2	0.5	24.0	0.2	0.1	125.2	0.0	107.5	1.5	0.6
Delay (s)	176.9	60.4	57.9	59.2	88.3	58.5	42.5	138.4	2.5	175.4	31.9	105.9
Level of Service	F	E	E	E	F	E	D	F	A	F	C	F
Approach Delay (s)		126.2			72.9			134.0			58.0	
Approach LOS		F			E			F			E	

Intersection Summary			
HCM Average Control Delay	107.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.21	1.00	1.00	0.75	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	390	1863	1583	1389	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	32	17	39	35	203	178	240	2513	15	149	864	111
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	18	41	37	214	187	253	2645	16	157	909	117
RTOR Reduction (vph)	0	0	36	0	0	113	0	0	3	0	0	82
Lane Group Flow (vph)	34	18	5	37	214	74	253	2645	13	157	909	35
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	17.8	17.8	17.8	17.8	17.8	17.8	74.2	104.4	104.4	13.0	43.2	43.2
Effective Green, g (s)	19.1	19.1	19.1	19.1	19.1	19.1	74.4	105.7	105.7	13.2	44.5	44.5
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.50	0.70	0.70	0.09	0.30	0.30
Clearance Time (s)	5.3	5.3	5.3	5.3	5.3	5.3	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	50	237	202	177	237	202	878	2494	1115	156	1050	470
v/s Ratio Prot		0.01			c0.11		0.14	c0.75		c0.09	0.26	
v/s Ratio Perm	0.09		0.00	0.03		0.05			0.01			0.02
v/c Ratio	0.68	0.08	0.03	0.21	0.90	0.36	0.29	1.06	0.01	1.01	0.87	0.07
Uniform Delay, d1	62.5	57.7	57.3	58.7	64.5	59.9	22.2	22.2	6.6	68.4	49.9	37.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	0.41	0.55
Incremental Delay, d2	31.8	0.1	0.1	0.6	33.6	1.1	0.2	36.6	0.0	67.1	8.0	0.3
Delay (s)	94.4	57.8	57.4	59.3	98.1	61.0	22.4	58.8	6.6	138.1	28.3	21.2
Level of Service	F	E	E	E	F	E	C	E	A	F	C	C
Approach Delay (s)		71.0			79.0			55.3			42.1	
Approach LOS		E			E			E			D	

Intersection Summary			
HCM Average Control Delay	54.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	105.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.69	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1287	1863	1583	786	1863	1583
Volume (vph)	516	2472	88	310	1258	184	114	132	340	87	59	182
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	543	2602	93	326	1324	194	120	139	358	92	62	192
RTOR Reduction (vph)	0	0	18	0	0	69	0	0	196	0	0	168
Lane Group Flow (vph)	543	2602	75	326	1324	125	120	139	162	92	62	24
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	48.3	93.8	93.8	23.8	69.3	69.3	17.6	17.6	17.6	17.6	17.6	17.6
Effective Green, g (s)	48.5	95.1	95.1	24.0	70.6	70.6	18.9	18.9	18.9	18.9	18.9	18.9
Actuated g/C Ratio	0.32	0.63	0.63	0.16	0.47	0.47	0.13	0.13	0.13	0.13	0.13	0.13
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	572	2244	1004	283	1666	745	162	235	199	99	235	199
v/s Ratio Prot	0.31	c0.74		c0.18	0.37			0.07			0.03	
v/s Ratio Perm			0.05			0.08	0.09		0.10	c0.12		0.02
v/c Ratio	0.95	1.16	0.07	1.15	0.79	0.17	0.74	0.59	0.82	0.93	0.26	0.12
Uniform Delay, d1	49.5	27.4	10.5	63.0	33.6	22.8	63.2	61.9	63.8	64.9	59.3	58.2
Progression Factor	1.00	0.92	0.84	0.50	0.23	0.02	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.0	73.5	0.0	91.7	2.6	0.3	16.6	4.0	22.0	67.1	0.6	0.3
Delay (s)	60.6	98.8	8.9	123.1	10.3	0.7	79.8	65.9	85.8	131.9	59.9	58.5
Level of Service	E	F	A	F	B	A	E	E	F	F	E	E
Approach Delay (s)		89.8			29.2			80.1			78.2	
Approach LOS		F			C			F			E	

Intersection Summary			
HCM Average Control Delay	69.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	110.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.16	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	289	3539	3539	1583
Volume (vph)	7	24	37	3069	1493	61
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	7	25	39	3231	1572	64
RTOR Reduction (vph)	0	25	0	0	0	5
Lane Group Flow (vph)	7	0	39	3231	1572	59
Turn Type		Perm	Perm			Perm
Protected Phases	7			2	6	
Permitted Phases		7	2			6
Actuated Green, G (s)	2.4	2.4	138.6	138.6	138.6	138.6
Effective Green, g (s)	2.9	2.9	139.1	139.1	139.1	139.1
Actuated g/C Ratio	0.02	0.02	0.93	0.93	0.93	0.93
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	34	31	268	3282	3282	1468
v/s Ratio Prot	c0.00			c0.91	0.44	
v/s Ratio Perm		0.00	0.14			0.04
v/c Ratio	0.21	0.02	0.15	0.98	0.48	0.04
Uniform Delay, d1	72.4	72.1	0.5	4.5	0.7	0.4
Progression Factor	1.00	1.00	1.00	1.00	0.21	0.00
Incremental Delay, d2	3.0	0.2	1.1	12.5	0.3	0.0
Delay (s)	75.4	72.4	1.6	17.0	0.5	0.0
Level of Service	E	E	A	B	A	A
Approach Delay (s)	73.0			16.8	0.5	
Approach LOS	E			B	A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						0.95	1.00	1.00	1.00	
Frt		0.94						1.00	0.85	1.00	1.00	
Flt Protected		0.97						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1441						3312	1482	1612	1696	
Flt Permitted		0.97						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1441						3312	1482	1612	1696	
Volume (vph)	738	6	520	0	0	0	0	466	365	283	511	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	777	6	547	0	0	0	0	491	384	298	538	0
RTOR Reduction (vph)	0	25	0	0	0	0	0	0	308	0	0	0
Lane Group Flow (vph)	0	1305	0	0	0	0	0	491	76	298	538	0
Heavy Vehicles (%)	21%	21%	21%	2%	2%	2%	9%	9%	9%	12%	12%	12%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		54.7						18.8	18.8	12.8	35.8	
Effective Green, g (s)		55.3						19.7	19.7	13.0	36.7	
Actuated g/C Ratio		0.55						0.20	0.20	0.13	0.37	
Clearance Time (s)		4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		797						652	292	210	622	
v/s Ratio Prot		c0.91						0.15		c0.18	c0.32	
v/s Ratio Perm									0.05			
v/c Ratio		1.64						0.75	0.26	1.42	0.86	
Uniform Delay, d1		22.4						37.9	34.0	43.5	29.4	
Progression Factor		1.00						1.00	1.00	1.15	0.95	
Incremental Delay, d2		292.5						7.9	2.1	191.1	1.6	
Delay (s)		314.8						45.7	36.1	241.0	29.5	
Level of Service		F						D	D	F	C	
Approach Delay (s)		314.8			0.0			41.5			104.9	
Approach LOS		F			A			D			F	

Intersection Summary			
HCM Average Control Delay	178.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	173.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	0.95			1.00	
Frt					0.98		1.00	1.00			0.94	
Flt Protected					0.96		0.95	1.00			1.00	
Satd. Flow (prot)					1571		1656	3312			1631	
Flt Permitted					0.96		0.95	1.00			1.00	
Satd. Flow (perm)					1571		1656	3312			1631	
Volume (vph)	0	0	0	248	3	34	207	997	0	0	546	496
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	261	3	36	218	1049	0	0	575	522
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	33	0
Lane Group Flow (vph)	0	0	0	0	295	0	218	1049	0	0	1064	0
Heavy Vehicles (%)	2%	2%	2%	14%	14%	14%	9%	9%	9%	9%	9%	9%
Turn Type				Split			Prot					
Protected Phases				8	8		5	2			6	
Permitted Phases												
Actuated Green, G (s)					16.4		11.8	74.1			58.1	
Effective Green, g (s)					17.0		12.0	75.0			59.0	
Actuated g/C Ratio					0.17		0.12	0.75			0.59	
Clearance Time (s)					4.6		4.2	4.9			4.9	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					267		199	2484			962	
v/s Ratio Prot					c0.19		c0.13	0.32			c0.65	
v/s Ratio Perm												
v/c Ratio					1.10		1.10	0.42			1.11	
Uniform Delay, d1					41.5		44.0	4.6			20.5	
Progression Factor					1.00		1.07	0.93			1.00	
Incremental Delay, d2					86.1		50.9	0.0			62.7	
Delay (s)					127.6		97.8	4.3			83.2	
Level of Service					F		F	A			F	
Approach Delay (s)		0.0			127.6			20.4			83.2	
Approach LOS		A			F			C			F	

Intersection Summary			
HCM Average Control Delay	58.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	173.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥						↑	↱	↰	↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00						1.00	1.00	1.00	1.00	
Frt		1.00						1.00	0.85	1.00	1.00	
Flt Protected		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770						1863	1583	1770	1863	
Flt Permitted		0.95						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770						1863	1583	1770	1863	
Volume (vph)	1296	0	37	0	0	0	0	147	948	580	868	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1364	0	39	0	0	0	0	155	998	611	914	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	633	0	0	0
Lane Group Flow (vph)	0	1402	0	0	0	0	0	155	365	611	914	0
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		53.4						20.7	20.7	21.8	46.7	
Effective Green, g (s)		54.0						22.0	22.0	22.0	48.0	
Actuated g/C Ratio		0.49						0.20	0.20	0.20	0.44	
Clearance Time (s)		4.6						5.3	5.3	4.2	5.3	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		869						373	317	354	813	
v/s Ratio Prot		c0.79						0.08		c0.35	c0.49	
v/s Ratio Perm									0.23			
v/c Ratio		1.61						0.42	1.15	1.73	1.12	
Uniform Delay, d1		28.0						38.4	44.0	44.0	31.0	
Progression Factor		1.00						1.00	1.00	0.43	0.18	
Incremental Delay, d2		281.3						3.4	98.4	327.8	57.7	
Delay (s)		309.3						41.8	142.4	346.8	63.3	
Level of Service		F						D	F	F	E	
Approach Delay (s)		309.3			0.0			128.8			176.9	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM Average Control Delay	208.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	289.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	1.00		1.00	0.92		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3167		1770	3532		1736	3199		1671	3120	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1736	3167		1770	3532		1736	3199		1671	3120	
Volume (vph)	884	919	1290	1412	734	10	5	1220	1334	5	582	465
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	931	967	1358	1486	773	11	5	1284	1404	5	613	489
RTOR Reduction (vph)	0	91	0	0	1	0	0	172	0	0	125	0
Lane Group Flow (vph)	931	2234	0	1486	783	0	5	2516	0	5	977	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	8%	8%	8%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	25.3	29.7		24.8	29.2		0.8	35.7		0.8	35.7	
Effective Green, g (s)	25.5	31.0		25.0	30.5		1.0	37.0		1.0	37.0	
Actuated g/C Ratio	0.23	0.28		0.23	0.28		0.01	0.34		0.01	0.34	
Clearance Time (s)	4.2	5.3		4.2	5.3		4.2	5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	402	893		402	979		16	1076		15	1049	
v/s Ratio Prot	0.54	c0.71		c0.84	0.22		0.00	c0.79		0.00	c0.31	
v/s Ratio Perm												
v/c Ratio	2.32	2.57dr		3.70	0.80		0.31	2.34		0.33	0.93	
Uniform Delay, d1	42.2	39.5		42.5	36.9		54.2	36.5		54.2	35.3	
Progression Factor	1.00	1.00		1.00	1.00		0.99	0.98		1.00	1.00	
Incremental Delay, d2	599.9	679.0		1219.5	4.8		1.0	602.5		12.7	15.5	
Delay (s)	642.2	718.5		1262.0	41.7		54.8	638.5		66.8	50.7	
Level of Service	F	F		F	D		D	F		E	D	
Approach Delay (s)		696.7			840.6			637.4			50.8	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM Average Control Delay	637.9	HCM Level of Service	F
HCM Volume to Capacity ratio	2.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	231.8%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	1.00			1.00	1.00
Frt					0.88		1.00	1.00			1.00	0.85
Flt Protected					0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1631		1770	1863			1863	1583
Flt Permitted					0.99		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1631		1770	1863			1863	1583
Volume (vph)	0	0	0	136	0	1010	41	1402	0	0	1312	1544
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	143	0	1063	43	1476	0	0	1381	1625
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	0	0	0	418
Lane Group Flow (vph)	0	0	0	0	1194	0	43	1476	0	0	1381	1207
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					45.4		3.4	54.7			47.1	47.1
Effective Green, g (s)					46.0		3.6	56.0			48.4	48.4
Actuated g/C Ratio					0.42		0.03	0.51			0.44	0.44
Clearance Time (s)					4.6		4.2	5.3			5.3	5.3
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					682		58	948			820	697
v/s Ratio Prot					c0.73		0.02	c0.79			0.74	
v/s Ratio Perm												c0.76
v/c Ratio					1.75		0.74	1.56			1.68	1.73
Uniform Delay, d1					32.0		52.7	27.0			30.8	30.8
Progression Factor					1.00		1.02	0.76			0.44	0.69
Incremental Delay, d2					343.7		4.6	251.1			308.4	330.0
Delay (s)					375.7		58.6	271.5			322.0	351.3
Level of Service					F		E	F			F	F
Approach Delay (s)		0.0			375.7			265.5			337.8	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	326.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	289.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3407	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	1770	1863	1583	1770	3407	
Volume (vph)	107	181	89	307	366	220	311	936	695	126	613	203
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	113	191	94	323	385	232	327	985	732	133	645	214
RTOR Reduction (vph)	0	0	79	0	0	172	0	0	226	0	28	0
Lane Group Flow (vph)	113	191	15	323	385	60	327	985	506	133	831	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			
Actuated Green, G (s)	8.8	20.3	20.3	14.8	26.3	26.3	39.0	68.0	68.0	10.1	39.1	
Effective Green, g (s)	9.0	20.5	20.5	15.0	26.5	26.5	39.2	68.2	68.2	10.3	39.3	
Actuated g/C Ratio	0.07	0.16	0.16	0.12	0.20	0.20	0.30	0.52	0.52	0.08	0.30	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	123	294	250	396	380	323	534	977	830	140	1030	
v/s Ratio Prot	c0.06	0.10		0.09	c0.21		0.18	c0.53		c0.08	0.24	
v/s Ratio Perm			0.01			0.04			0.32			
v/c Ratio	0.92	0.65	0.06	0.82	1.01	0.19	0.61	1.01	0.61	0.95	0.81	
Uniform Delay, d1	60.1	51.4	46.6	56.1	51.8	42.8	38.9	30.9	21.6	59.6	41.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	0.38	
Incremental Delay, d2	56.0	4.9	0.1	12.2	49.5	0.3	2.1	30.8	3.3	44.0	4.0	
Delay (s)	116.1	56.3	46.7	68.4	101.3	43.1	41.0	61.7	24.9	111.4	19.9	
Level of Service	F	E	D	E	F	D	D	E	C	F	B	
Approach Delay (s)		71.0			75.6			45.2			32.2	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM Average Control Delay	51.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1770	1583
Volume (vph)	125	176	765	246	426	838
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	185	805	259	448	882
RTOR Reduction (vph)	0	165	0	0	0	65
Lane Group Flow (vph)	132	20	805	259	448	817
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases		4				2
Actuated Green, G (s)	14.0	14.0	68.9	87.1	34.5	103.4
Effective Green, g (s)	14.2	14.2	69.1	87.3	34.7	103.8
Actuated g/C Ratio	0.11	0.11	0.53	0.67	0.27	0.80
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	203	173	941	1251	472	1313
v/s Ratio Prot	c0.07		c0.45	0.14	c0.25	0.33
v/s Ratio Perm		0.01				0.19
v/c Ratio	0.65	0.12	0.86	0.21	0.95	0.62
Uniform Delay, d1	55.5	52.2	26.2	8.1	46.8	5.2
Progression Factor	1.00	1.00	0.36	0.14	0.58	0.26
Incremental Delay, d2	7.2	0.3	8.8	0.3	15.5	0.4
Delay (s)	62.8	52.5	18.3	1.5	42.6	1.8
Level of Service	E	D	B	A	D	A
Approach Delay (s)	56.8			14.2	15.5	
Approach LOS	E			B	B	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	423	664	822	289	131	190
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	445	699	865	304	138	200
RTOR Reduction (vph)	0	0	0	152	0	176
Lane Group Flow (vph)	445	699	865	152	138	24
Turn Type	Prot			Perm		Perm
Protected Phases	1	6	2		8	
Permitted Phases				2		8
Actuated Green, G (s)	37.5	106.5	64.8	64.8	15.1	15.1
Effective Green, g (s)	37.7	106.7	65.0	65.0	15.3	15.3
Actuated g/C Ratio	0.29	0.82	0.50	0.50	0.12	0.12
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	513	2905	1770	792	208	186
v/s Ratio Prot	c0.25	0.20	c0.24		c0.08	
v/s Ratio Perm				0.10		0.01
v/c Ratio	0.87	0.24	0.49	0.19	0.66	0.13
Uniform Delay, d1	43.8	2.6	21.5	18.0	54.9	51.4
Progression Factor	1.20	1.16	0.38	0.56	1.00	1.00
Incremental Delay, d2	12.2	0.2	0.7	0.4	7.7	0.3
Delay (s)	64.8	3.2	8.9	10.5	62.6	51.7
Level of Service	E	A	A	B	E	D
Approach Delay (s)		27.1	9.3		56.1	
Approach LOS		C	A		E	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Volume (vph)	106	1231	1567	211	84	53
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	112	1296	1649	222	88	56
RTOR Reduction (vph)	0	0	0	56	0	51
Lane Group Flow (vph)	112	1296	1649	166	88	5
Turn Type	Prot			Perm		custom
Protected Phases	7	4	8			
Permitted Phases				8	6	6
Actuated Green, G (s)	13.3	110.0	92.5	92.5	11.6	11.6
Effective Green, g (s)	13.5	110.2	92.7	92.7	11.8	11.8
Actuated g/C Ratio	0.10	0.85	0.71	0.71	0.09	0.09
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	184	3000	2524	1129	161	144
v/s Ratio Prot	c0.06	0.37	c0.47			
v/s Ratio Perm				0.10	c0.05	0.00
v/c Ratio	0.61	0.43	0.65	0.15	0.55	0.04
Uniform Delay, d1	55.7	2.4	10.0	6.0	56.5	53.9
Progression Factor	0.89	1.77	0.30	0.08	1.00	1.00
Incremental Delay, d2	5.6	0.5	0.7	0.2	3.8	0.1
Delay (s)	54.9	4.7	3.8	0.6	60.3	54.0
Level of Service	D	A	A	A	E	D
Approach Delay (s)		8.7	3.4		57.9	
Approach LOS		A	A		E	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3494		1770	3538		1770	1723		1770	1594	
Flt Permitted	0.95	1.00		0.95	1.00		0.56	1.00		0.75	1.00	
Satd. Flow (perm)	1770	3494		1770	3538		1046	1723		1399	1594	
Volume (vph)	216	1201	112	5	1615	5	164	5	5	5	5	116
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	227	1264	118	5	1700	5	173	5	5	5	5	122
RTOR Reduction (vph)	0	5	0	0	0	0	0	4	0	0	99	0
Lane Group Flow (vph)	227	1377	0	5	1705	0	173	6	0	5	28	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	19.3	92.8		0.8	74.3		23.8	23.8		23.8	23.8	
Effective Green, g (s)	19.5	93.0		1.0	74.5		24.0	24.0		24.0	24.0	
Actuated g/C Ratio	0.15	0.72		0.01	0.57		0.18	0.18		0.18	0.18	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	266	2500		14	2028		193	318		258	294	
v/s Ratio Prot	c0.13	0.39		0.00	c0.48			0.00			0.02	
v/s Ratio Perm							c0.17			0.00		
v/c Ratio	0.85	0.55		0.36	0.84		0.90	0.02		0.02	0.09	
Uniform Delay, d1	53.9	8.7		64.2	22.9		51.8	43.4		43.4	44.0	
Progression Factor	1.07	0.69		0.82	0.69		1.00	1.00		1.00	1.00	
Incremental Delay, d2	21.3	0.8		12.1	3.6		37.0	0.0		0.0	0.1	
Delay (s)	79.1	6.8		64.6	19.3		88.8	43.4		43.4	44.1	
Level of Service	E	A		E	B		F	D		D	D	
Approach Delay (s)		17.0			19.4			86.3			44.1	
Approach LOS		B			B			F			D	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3375		1770	3537		1770	1767		1770	1598	
Flt Permitted	0.95	1.00		0.95	1.00		0.67	1.00		0.37	1.00	
Satd. Flow (perm)	1770	3375		1770	3537		1253	1767		687	1598	
Volume (vph)	216	485	218	59	1109	5	178	172	89	5	7	118
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	227	511	229	62	1167	5	187	181	94	5	7	124
RTOR Reduction (vph)	0	65	0	0	1	0	0	31	0	0	97	0
Lane Group Flow (vph)	227	675	0	62	1171	0	187	244	0	5	34	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	11.4	34.5		4.2	27.3		13.7	13.7		13.7	13.7	
Effective Green, g (s)	11.6	34.7		4.4	27.5		13.9	13.9		13.9	13.9	
Actuated g/C Ratio	0.18	0.53		0.07	0.42		0.21	0.21		0.21	0.21	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	316	1802		120	1496		268	378		147	342	
v/s Ratio Prot	c0.13	0.20		0.04	c0.33			0.14			0.02	
v/s Ratio Perm							c0.15			0.01		
v/c Ratio	0.72	0.37		0.52	0.78		0.70	0.64		0.03	0.10	
Uniform Delay, d1	25.2	8.8		29.3	16.2		23.6	23.3		20.2	20.5	
Progression Factor	0.84	0.47		1.45	0.27		0.81	0.78		1.00	1.00	
Incremental Delay, d2	6.6	0.5		1.9	2.2		3.2	1.5		0.1	0.1	
Delay (s)	27.7	4.6		44.4	6.6		22.3	19.8		20.3	20.6	
Level of Service	C	A		D	A		C	B		C	C	
Approach Delay (s)		10.0			8.5			20.8			20.6	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.85	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3486		1770	1506	1504	1770	1598	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.67	1.00	1.00	0.15	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3486		1256	1506	1504	276	1598	
Volume (vph)	225	427	108	165	897	101	231	6	1414	134	7	116
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	237	449	114	174	944	106	243	6	1488	141	7	122
RTOR Reduction (vph)	0	0	79	0	13	0	0	245	245	0	71	0
Lane Group Flow (vph)	237	449	35	174	1037	0	243	505	499	141	58	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	6.8	19.6	19.6	6.0	18.8		26.8	26.8	26.8	26.8	26.8	
Effective Green, g (s)	7.0	19.8	19.8	6.2	19.0		27.0	27.0	27.0	27.0	27.0	
Actuated g/C Ratio	0.11	0.30	0.30	0.10	0.29		0.42	0.42	0.42	0.42	0.42	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	191	1078	482	327	1019		522	626	625	115	664	
v/s Ratio Prot	c0.13	0.13		0.05	c0.30			0.34			0.04	
v/s Ratio Perm			0.02				0.19		0.33	c0.51		
v/c Ratio	1.24	0.42	0.07	0.53	1.02		0.47	0.81	0.80	1.23	0.09	
Uniform Delay, d1	29.0	18.0	16.1	28.0	23.0		13.8	16.7	16.6	19.0	11.5	
Progression Factor	0.85	0.69	0.30	0.86	1.07		0.89	0.96	0.95	1.00	1.00	
Incremental Delay, d2	143.6	0.3	0.1	5.7	31.5		0.5	5.9	5.5	156.8	0.1	
Delay (s)	168.3	12.8	4.9	29.8	56.2		12.8	21.8	21.3	175.8	11.6	
Level of Service	F	B	A	C	E		B	C	C	F	B	
Approach Delay (s)		57.7			52.4			20.3			97.3	
Approach LOS		E			D			C			F	

Intersection Summary			
HCM Average Control Delay	42.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3535		1770	1508	1504	1770	1650	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.74	1.00	1.00	0.29	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3535		1385	1508	1504	540	1650	
Volume (vph)	21	1882	47	410	1050	9	87	5	583	6	5	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	1981	49	432	1105	9	92	5	614	6	5	16
RTOR Reduction (vph)	0	0	6	0	0	0	0	220	220	0	14	0
Lane Group Flow (vph)	22	1981	43	432	1114	0	92	92	87	6	7	0
Turn Type	Prot		Perm	Prot			Perm		Perm	Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2		2	6		
Actuated Green, G (s)	3.8	82.0	82.0	21.8	100.0		13.6	13.6	13.6	13.6	13.6	
Effective Green, g (s)	4.0	82.2	82.2	22.0	100.2		13.8	13.8	13.8	13.8	13.8	
Actuated g/C Ratio	0.03	0.63	0.63	0.17	0.77		0.11	0.11	0.11	0.11	0.11	
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	54	2238	1001	581	2725		147	160	160	57	175	
v/s Ratio Prot	0.01	c0.56		c0.13	0.32			0.06			0.00	
v/s Ratio Perm			0.03				c0.07		0.06	0.01		
v/c Ratio	0.41	0.89	0.04	0.74	0.41		0.63	0.58	0.54	0.11	0.04	
Uniform Delay, d1	61.8	20.0	9.0	51.3	5.0		55.6	55.3	55.1	52.5	52.1	
Progression Factor	0.98	0.73	0.65	1.00	1.00		1.02	1.16	1.17	1.00	1.00	
Incremental Delay, d2	2.9	2.8	0.0	8.4	0.5		7.5	4.6	3.5	0.8	0.1	
Delay (s)	63.5	17.3	5.9	59.7	5.4		64.4	68.8	68.1	53.3	52.2	
Level of Service	E	B	A	E	A		E	E	E	D	D	
Approach Delay (s)		17.5			20.6			67.9			52.5	
Approach LOS		B			C			E			D	

Intersection Summary			
HCM Average Control Delay	27.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2413	21	0	1438	0	591
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	2540	22	0	1514	0	622
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)	659					
pX, platoon unblocked			0.45		0.45	0.45
vC, conflicting volume			2562		3297	1270
vC1, stage 1 conf vol					2540	
vC2, stage 2 conf vol					757	
vCu, unblocked vol			3252		4889	374
tC, single (s)			4.1		6.8	*0.1
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	*2.2
p0 queue free %			100		100	23
cM capacity (veh/h)			40		7	813

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	1270	1270	22	757	757	622
Volume Left	0	0	0	0	0	0
Volume Right	0	0	22	0	0	622
cSH	1700	1700	1700	1700	1700	813
Volume to Capacity	0.75	0.75	0.01	0.45	0.45	0.77
Queue Length 95th (ft)	0	0	0	0	0	186
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	22.3
Lane LOS						C
Approach Delay (s)	0.0			0.0		22.3
Approach LOS						C

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.86		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1627		1770	1595		1770	3505		1770	3479	
Flt Permitted	0.68	1.00		0.74	1.00		0.60	1.00		0.10	1.00	
Satd. Flow (perm)	1269	1627		1372	1595		1124	3505		180	3479	
Volume (vph)	2	5	26	110	5	107	116	1541	107	52	201	26
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	5	27	116	5	113	122	1622	113	55	212	27
RTOR Reduction (vph)	0	23	0	0	24	0	0	5	0	0	7	0
Lane Group Flow (vph)	2	9	0	116	94	0	122	1730	0	55	232	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.2	9.2		9.2	9.2		47.4	47.4		47.4	47.4	
Effective Green, g (s)	9.4	9.4		9.4	9.4		47.6	47.6		47.6	47.6	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2		4.2	4.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	184	235		198	231		823	2567		132	2548	
v/s Ratio Prot		0.01			0.06			c0.49			0.07	
v/s Ratio Perm	0.00			c0.08			0.11			0.31		
v/c Ratio	0.01	0.04		0.59	0.41		0.15	0.67		0.42	0.09	
Uniform Delay, d1	23.8	23.9		26.0	25.3		2.6	4.6		3.4	2.5	
Progression Factor	1.00	1.00		1.00	1.00		0.93	1.02		1.19	0.23	
Incremental Delay, d2	0.0	0.1		4.4	1.2		0.1	0.5		8.8	0.1	
Delay (s)	23.8	24.0		30.4	26.4		2.6	5.2		12.8	0.7	
Level of Service	C	C		C	C		A	A		B	A	
Approach Delay (s)		24.0			28.4			5.0			2.9	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰↰	↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	3539	1770	1583
Volume (vph)	239	304	89	608	1227	791
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	252	320	94	640	1292	833
RTOR Reduction (vph)	0	4	0	0	0	75
Lane Group Flow (vph)	252	316	94	640	1292	758
Turn Type		pm+ov	Prot			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	14.3	110.2	7.2	25.7	95.9	95.9
Effective Green, g (s)	14.5	110.6	7.4	25.9	96.1	96.1
Actuated g/C Ratio	0.11	0.85	0.06	0.20	0.74	0.74
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	395	1395	195	705	1308	1170
v/s Ratio Prot	0.07	0.17	0.03	c0.18	c0.73	
v/s Ratio Perm		0.03				0.48
v/c Ratio	0.64	0.23	0.48	0.91	0.99	0.65
Uniform Delay, d1	55.2	1.8	59.4	50.9	16.4	8.5
Progression Factor	1.00	1.00	0.56	0.50	1.14	0.94
Incremental Delay, d2	3.4	0.1	1.0	9.1	21.7	2.7
Delay (s)	58.6	1.9	34.3	34.4	40.5	10.7
Level of Service	E	A	C	C	D	B
Approach Delay (s)	26.9			34.4	28.8	
Approach LOS	C			C	C	

Intersection Summary			
HCM Average Control Delay	29.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1837		1770	1833		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1837		1770	1833		1770	1863	1583
Volume (vph)	388	481	64	11	500	51	240	428	51	7	137	74
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	408	506	67	12	526	54	253	451	54	7	144	78
RTOR Reduction (vph)	0	0	18	0	3	0	0	3	0	0	0	69
Lane Group Flow (vph)	408	506	49	12	577	0	253	502	0	7	144	9
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	33.4	69.2	69.2	1.6	37.4		27.1	41.6		0.8	15.3	15.3
Effective Green, g (s)	33.6	69.4	69.4	1.8	37.6		27.3	41.8		1.0	15.5	15.5
Actuated g/C Ratio	0.26	0.53	0.53	0.01	0.29		0.21	0.32		0.01	0.12	0.12
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	457	995	845	25	531		372	589		14	222	189
v/s Ratio Prot	c0.23	0.27		0.01	c0.31		0.14	c0.27		0.00	c0.08	
v/s Ratio Perm			0.03									0.01
v/c Ratio	0.89	0.51	0.06	0.48	1.09		0.68	0.85		0.50	0.65	0.05
Uniform Delay, d1	46.5	19.4	14.6	63.6	46.2		47.3	41.2		64.3	54.7	50.7
Progression Factor	0.95	0.77	0.50	1.14	0.72		0.77	0.73		0.85	1.05	1.77
Incremental Delay, d2	15.2	1.4	0.1	11.7	61.8		3.7	8.6		24.2	6.1	0.1
Delay (s)	59.2	16.3	7.4	84.6	95.0		40.3	38.6		78.6	63.6	89.7
Level of Service	E	B	A	F	F		D	D		E	E	F
Approach Delay (s)		33.5			94.8			39.2			72.9	
Approach LOS		C			F			D			E	

Intersection Summary			
HCM Average Control Delay	52.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1739		1770	3497		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1739		1770	3497		1770	3539	1583
Volume (vph)	274	122	142	28	111	88	358	1719	149	2	439	92
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	288	128	149	29	117	93	377	1809	157	2	462	97
RTOR Reduction (vph)	0	0	108	0	22	0	0	5	0	0	0	39
Lane Group Flow (vph)	288	128	41	29	188	0	377	1961	0	2	462	58
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	20.9	35.3	35.3	3.7	18.1		56.3	73.4		0.8	17.9	17.9
Effective Green, g (s)	21.1	35.5	35.5	3.9	18.3		56.5	73.6		1.0	18.1	18.1
Actuated g/C Ratio	0.16	0.27	0.27	0.03	0.14		0.43	0.57		0.01	0.14	0.14
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	287	509	432	53	245		769	1980		14	493	220
v/s Ratio Prot	c0.16	0.07		0.02	c0.11		0.21	c0.56		0.00	c0.13	
v/s Ratio Perm			0.03									0.04
v/c Ratio	1.00	0.25	0.09	0.55	0.77		0.49	0.99		0.14	0.94	0.26
Uniform Delay, d1	54.4	36.9	35.3	62.2	53.8		26.4	27.9		64.1	55.4	50.0
Progression Factor	0.86	0.66	0.32	0.91	0.95		0.54	0.39		0.96	0.94	0.90
Incremental Delay, d2	50.7	0.2	0.1	10.0	12.1		0.4	16.3		4.6	27.5	2.9
Delay (s)	97.7	24.4	11.2	66.5	63.2		14.6	27.2		65.9	79.6	47.9
Level of Service	F	C	B	E	E		B	C		E	E	D
Approach Delay (s)		58.3			63.6			25.1			74.1	
Approach LOS		E			E			C			E	

Intersection Summary			
HCM Average Control Delay	40.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	221	4	52	37	183	252	39	8	7	38	1	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	233	4	55	39	193	265	41	8	7	40	1	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1244										
pX, platoon unblocked												
vC, conflicting volume	458			59			773	1033	32	884	927	325
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	458			59			773	1033	32	884	927	325
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	79			97			84	95	99	81	99	99
cM capacity (veh/h)	1103			1545			257	179	1042	210	206	716

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	233	59	39	458	57	46
Volume Left	233	0	39	0	41	40
Volume Right	0	55	0	265	7	5
cSH	1103	1700	1545	1700	266	228
Volume to Capacity	0.21	0.03	0.03	0.27	0.21	0.20
Queue Length 95th (ft)	20	0	2	0	20	19
Control Delay (s)	9.1	0.0	7.4	0.0	22.2	24.8
Lane LOS	A		A		C	C
Approach Delay (s)	7.3		0.6		22.2	24.8
Approach LOS					C	C

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	332	88	250	288	75	5	545	1642	106	5	1153	213
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	349	93	263	303	79	5	574	1728	112	5	1214	224
RTOR Reduction (vph)	0	0	240	0	0	5	0	0	34	0	0	104
Lane Group Flow (vph)	349	93	23	303	79	0	574	1728	78	5	1214	120
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	32.6	11.4	11.4	30.6	9.4	9.4	23.2	70.4	70.4	0.8	48.0	48.0
Effective Green, g (s)	32.8	11.6	11.6	30.8	9.6	9.6	23.4	70.6	70.6	1.0	48.2	48.2
Actuated g/C Ratio	0.25	0.09	0.09	0.24	0.07	0.07	0.18	0.54	0.54	0.01	0.37	0.37
Clearance Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	447	166	141	419	138	117	618	1922	860	14	1312	587
v/s Ratio Prot	c0.20	c0.05		0.17	0.04		0.17	c0.49		0.00	c0.34	
v/s Ratio Perm			0.01			0.00			0.05			0.08
v/c Ratio	0.78	0.56	0.17	0.72	0.57	0.00	0.93	0.90	0.09	0.36	0.93	0.20
Uniform Delay, d1	45.3	56.8	54.7	45.7	58.2	55.8	52.5	26.5	14.3	64.2	39.2	27.8
Progression Factor	1.05	0.96	1.09	1.00	1.00	1.00	1.00	1.00	1.00	0.52	0.30	0.13
Incremental Delay, d2	8.5	4.2	0.6	6.1	5.6	0.0	20.3	7.2	0.2	11.3	9.9	0.6
Delay (s)	56.1	58.8	60.0	51.8	63.8	55.8	72.8	33.7	14.5	44.9	21.6	4.3
Level of Service	E	E	E	D	E	E	E	C	B	D	C	A
Approach Delay (s)		57.9			54.3			42.1			19.0	
Approach LOS		E			D			D			B	

Intersection Summary			
HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5076		3433	5085	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.76	1.00	1.00	0.49	1.00	1.00
Satd. Flow (perm)	1770	5076		3433	5085	1583	1407	1863	1583	916	1863	1583
Volume (vph)	442	1893	24	64	1314	145	116	180	402	51	4	169
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	465	1993	25	67	1383	153	122	189	423	54	4	178
RTOR Reduction (vph)	0	1	0	0	0	54	0	0	68	0	0	134
Lane Group Flow (vph)	465	2017	0	67	1383	99	122	189	355	54	4	44
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	37.4	80.0		5.2	47.8	47.8	32.2	32.2	32.2	32.2	32.2	32.2
Effective Green, g (s)	37.6	80.2		5.4	48.0	48.0	32.4	32.4	32.4	32.4	32.4	32.4
Actuated g/C Ratio	0.29	0.62		0.04	0.37	0.37	0.25	0.25	0.25	0.25	0.25	0.25
Clearance Time (s)	4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	512	3132		143	1878	584	351	464	395	228	464	395
v/s Ratio Prot	c0.26	0.40		0.02	c0.27			0.10			0.00	
v/s Ratio Perm						0.06	0.09		c0.22	0.06		0.03
v/c Ratio	0.91	0.64		0.47	0.74	0.17	0.35	0.41	0.90	0.24	0.01	0.11
Uniform Delay, d1	44.5	15.8		60.9	35.5	27.6	40.1	40.8	47.2	38.9	36.7	37.7
Progression Factor	0.70	0.45		1.34	0.54	0.35	1.00	1.00	1.00	1.62	1.69	6.20
Incremental Delay, d2	15.0	0.7		2.2	2.4	0.6	0.6	0.6	22.5	0.5	0.0	0.1
Delay (s)	46.2	7.8		84.1	21.6	10.2	40.7	41.4	69.7	63.5	62.1	233.8
Level of Service	D	A		F	C	B	D	D	E	E	E	F
Approach Delay (s)		15.0			23.2			57.6			191.9	
Approach LOS		B			C			E			F	

Intersection Summary			
HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	1.00	0.88	1.00	1.00	0.88
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5072		3433	5085	1583	1770	1863	2787	1770	1863	2787
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5072		3433	5085	1583	1770	1863	2787	1770	1863	2787
Volume (vph)	888	1843	33	195	880	536	38	284	988	197	23	390
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	935	1940	35	205	926	564	40	299	1040	207	24	411
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	30	0	0	93
Lane Group Flow (vph)	935	1974	0	205	926	564	40	299	1010	207	24	318
Turn Type	Prot			Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases						Free			2			6
Actuated Green, G (s)	38.9	48.8		25.8	35.7	130.0	27.3	23.4	49.2	15.2	11.3	50.2
Effective Green, g (s)	39.1	49.0		26.0	35.9	130.0	27.5	23.6	49.6	15.4	11.5	50.6
Actuated g/C Ratio	0.30	0.38		0.20	0.28	1.00	0.21	0.18	0.38	0.12	0.09	0.39
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1033	1912		687	1404	1583	374	338	1063	210	165	1085
v/s Ratio Prot	0.27	c0.39		0.06	0.18		0.02	0.16	c0.19	c0.12	0.01	0.09
v/s Ratio Perm						c0.36			0.17			0.03
v/c Ratio	0.91	1.03		0.30	0.66	0.36	0.11	0.88	0.95	0.99	0.15	0.29
Uniform Delay, d1	43.7	40.5		44.2	41.6	0.0	41.3	51.9	39.0	57.2	54.7	27.4
Progression Factor	0.85	0.81		0.65	0.62	1.00	1.00	1.00	1.00	0.41	0.33	2.01
Incremental Delay, d2	9.4	27.6		0.2	2.2	0.6	0.1	22.9	17.0	51.0	0.3	0.1
Delay (s)	46.4	60.5		28.8	27.8	0.6	41.5	74.8	56.0	74.7	18.3	55.1
Level of Service	D	E		C	C	A	D	E	E	E	B	E
Approach Delay (s)		56.0			18.9			59.6			60.0	
Approach LOS		E			B			E			E	

Intersection Summary			
HCM Average Control Delay	47.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5082		1770	4936		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.75	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	1770	5082		1770	4936		1405	1863	1583	865	1863	1583
Volume (vph)	139	2817	12	68	1164	282	101	229	576	51	5	19
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	146	2965	13	72	1225	297	106	241	606	54	5	20
RTOR Reduction (vph)	0	0	0	0	30	0	0	0	58	0	0	14
Lane Group Flow (vph)	146	2978	0	72	1492	0	106	241	548	54	5	6
Turn Type	Prot			Prot			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2		2	6		6
Actuated Green, G (s)	15.1	70.9		5.6	61.4		40.9	40.9	40.9	40.9	40.9	40.9
Effective Green, g (s)	15.3	71.1		5.8	61.6		41.1	41.1	41.1	41.1	41.1	41.1
Actuated g/C Ratio	0.12	0.55		0.04	0.47		0.32	0.32	0.32	0.32	0.32	0.32
Clearance Time (s)	4.2	4.2		4.2	4.2		4.2	4.2	4.2	4.2	4.2	4.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	208	2779		79	2339		444	589	500	273	589	500
v/s Ratio Prot	0.08	c0.59		c0.04	0.30			0.13			0.00	
v/s Ratio Perm							0.08		c0.35	0.06		0.00
v/c Ratio	0.70	1.07		0.91	0.64		0.24	0.41	1.10	0.20	0.01	0.01
Uniform Delay, d1	55.2	29.5		61.8	25.8		32.9	34.9	44.4	32.4	30.5	30.5
Progression Factor	1.17	0.56		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.02
Incremental Delay, d2	2.7	34.4		71.7	1.3		0.3	0.5	68.9	0.4	0.0	0.0
Delay (s)	67.1	51.0		133.5	27.1		33.2	35.4	113.3	32.9	30.5	31.1
Level of Service	E	D		F	C		C	D	F	C	C	C
Approach Delay (s)		51.8			31.9			84.7			32.3	
Approach LOS		D			C			F			C	

Intersection Summary			
HCM Average Control Delay	51.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	103.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00	0.97	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3155	4673	1455	1671	4803	1495	2993	3003		1480	2959	1324
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3155	4673	1455	1671	4803	1495	2993	3003		1480	2959	1324
Volume (vph)	154	794	265	120	1948	158	580	445	96	189	405	98
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	162	836	279	126	2051	166	611	468	101	199	426	103
RTOR Reduction (vph)	0	0	215	0	0	73	0	16	0	0	0	87
Lane Group Flow (vph)	162	836	64	126	2051	93	611	554	0	199	426	16
Heavy Vehicles (%)	11%	11%	11%	8%	8%	8%	17%	17%	17%	22%	22%	22%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	7.0	26.9	26.9	32.2	52.1	52.1	25.3	25.7		16.9	18.0	18.0
Effective Green, g (s)	7.2	27.5	27.5	32.4	52.7	52.7	25.5	27.0		17.1	18.6	18.6
Actuated g/C Ratio	0.06	0.23	0.23	0.27	0.44	0.44	0.21	0.22		0.14	0.16	0.16
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6	4.6	4.2	5.3		4.2	4.6	4.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	189	1071	333	451	2109	657	636	676		211	459	205
v/s Ratio Prot	0.05	c0.18		0.08	c0.43		c0.20	0.18		0.13	c0.14	
v/s Ratio Perm			0.04			0.06						0.01
v/c Ratio	0.86	0.78	0.19	0.28	0.97	0.14	0.96	0.82		0.94	0.93	0.08
Uniform Delay, d1	55.9	43.4	37.3	34.6	32.9	20.1	46.8	44.2		51.0	50.0	43.4
Progression Factor	0.82	0.86	1.90	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	27.4	5.1	1.2	0.3	14.1	0.5	26.1	7.7		45.8	24.9	0.2
Delay (s)	73.0	42.6	71.9	34.9	47.0	20.6	72.9	51.8		96.8	75.0	43.5
Level of Service	E	D	E	C	D	C	E	D		F	E	D
Approach Delay (s)		52.9			44.5			62.7			76.5	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM Average Control Delay	54.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	5055		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	5055		1770	3539	1583
Volume (vph)	298	106	96	8	44	72	105	800	33	84	1780	256
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	314	112	101	8	46	76	111	842	35	88	1874	269
RTOR Reduction (vph)	0	0	77	0	0	69	0	3	0	0	0	79
Lane Group Flow (vph)	314	112	24	8	46	7	111	874	0	88	1874	190
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	18.8	27.4	27.4	0.9	9.5	9.5	7.7	62.9		9.8	65.0	65.0
Effective Green, g (s)	19.0	28.7	28.7	1.1	10.8	10.8	7.9	64.2		10.0	66.3	66.3
Actuated g/C Ratio	0.16	0.24	0.24	0.01	0.09	0.09	0.07	0.54		0.08	0.55	0.55
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3		4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	280	446	379	16	168	251	117	2704		148	1955	875
v/s Ratio Prot	c0.18	c0.06		0.00	0.02		c0.06	0.17		0.05	c0.53	
v/s Ratio Perm			0.02			0.00						0.12
v/c Ratio	1.12	0.25	0.06	0.50	0.27	0.03	0.95	0.32		0.59	0.96	0.22
Uniform Delay, d1	50.5	37.0	35.3	59.2	50.9	49.8	55.8	15.7		53.0	25.5	13.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.02	0.94		0.96	0.42	0.20
Incremental Delay, d2	90.5	0.3	0.1	22.5	0.9	0.0	64.5	0.3		0.6	1.8	0.1
Delay (s)	141.0	37.2	35.3	81.7	51.8	49.9	121.3	15.0		51.3	12.4	2.8
Level of Service	F	D	D	F	D	D	F	B		D	B	A
Approach Delay (s)		98.7			52.5			26.9			12.8	
Approach LOS		F			D			C			B	

Intersection Summary			
HCM Average Control Delay	29.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5034		1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.52	1.00	1.00	0.73	1.00	1.00
Satd. Flow (perm)	1770	5034		1770	3539	1583	975	1863	1583	1367	1863	1583
Volume (vph)	104	1056	77	115	2519	58	92	34	286	221	129	319
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	109	1112	81	121	2652	61	97	36	301	233	136	336
RTOR Reduction (vph)	0	6	0	0	0	14	0	0	239	0	0	67
Lane Group Flow (vph)	109	1187	0	121	2652	47	97	36	62	233	136	269
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	6.8	74.4		12.8	80.4	80.4	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	7.0	75.7		13.0	81.7	81.7	19.3	19.3	19.3	19.3	19.3	19.3
Actuated g/C Ratio	0.06	0.63		0.11	0.68	0.68	0.16	0.16	0.16	0.16	0.16	0.16
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	103	3176		192	2409	1078	157	300	255	220	300	255
v/s Ratio Prot	c0.06	0.24		0.07	c0.75			0.02			0.07	
v/s Ratio Perm						0.03	0.10		0.04	c0.17		0.17
v/c Ratio	1.06	0.37		0.63	1.10	0.04	0.62	0.12	0.24	1.06	0.45	1.05
Uniform Delay, d1	56.5	10.7		51.2	19.1	6.3	46.9	43.1	44.0	50.3	45.6	50.3
Progression Factor	0.95	0.93		1.28	0.60	0.13	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	101.8	0.3		0.6	46.1	0.0	7.1	0.2	0.5	77.1	1.1	71.4
Delay (s)	155.7	10.3		66.2	57.6	0.8	54.0	43.3	44.5	127.5	46.7	121.7
Level of Service	F	B		E	E	A	D	D	D	F	D	F
Approach Delay (s)		22.4			56.8			46.5			109.2	
Approach LOS		C			E			D			F	

Intersection Summary			
HCM Average Control Delay	54.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95	1.00	1.00	1.00	
Frt	1.00	0.90						1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.98						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1383	1294						2888	1292	1583	1667	
Flt Permitted	0.95	0.98						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1383	1294						2888	1292	1583	1667	
Volume (vph)	317	3	162	0	0	0	0	436	250	20	378	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	334	3	171	0	0	0	0	459	263	21	398	0
RTOR Reduction (vph)	0	121	0	0	0	0	0	0	126	0	0	0
Lane Group Flow (vph)	240	147	0	0	0	0	0	459	137	21	398	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	25%	25%	25%	14%	14%	14%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	14.9	14.9						30.4	30.4	1.0	35.6	
Effective Green, g (s)	15.5	15.5						31.3	31.3	1.2	36.5	
Actuated g/C Ratio	0.26	0.26						0.52	0.52	0.02	0.61	
Clearance Time (s)	4.6	4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	357	334						1507	674	32	1014	
v/s Ratio Prot	c0.17	0.11						0.16		0.01	c0.24	
v/s Ratio Perm									0.11			
v/c Ratio	0.67	0.44						0.30	0.20	0.66	0.39	
Uniform Delay, d1	20.0	18.6						8.2	7.7	29.2	6.0	
Progression Factor	1.00	1.00						1.00	1.00	1.45	0.23	
Incremental Delay, d2	4.9	0.9						0.5	0.7	26.8	0.7	
Delay (s)	24.9	19.6						8.7	8.4	69.1	2.1	
Level of Service	C	B						A	A	E	A	
Approach Delay (s)		22.1			0.0			8.6			5.5	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	11.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	106.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	0.95			1.00	1.00
Frt					0.97		1.00	1.00			1.00	0.85
Flt Protected					0.96		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1541		1388	2777			1597	1357
Flt Permitted					0.96		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1541		1388	2777			1597	1357
Volume (vph)	0	0	0	309	5	101	202	551	0	0	89	813
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	325	5	106	213	580	0	0	94	856
RTOR Reduction (vph)	0	0	0	0	19	0	0	0	0	0	0	523
Lane Group Flow (vph)	0	0	0	0	417	0	213	580	0	0	94	333
Heavy Vehicles (%)	2%	2%	2%	15%	15%	15%	30%	30%	30%	19%	19%	19%
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					17.2		11.3	33.3			17.8	17.8
Effective Green, g (s)					17.8		11.5	34.2			18.7	18.7
Actuated g/C Ratio					0.30		0.19	0.57			0.31	0.31
Clearance Time (s)					4.6		4.2	4.9			4.9	4.9
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					457		266	1583			498	423
v/s Ratio Prot					c0.27		c0.15	0.21			0.06	
v/s Ratio Perm												c0.25
v/c Ratio					0.91		0.80	0.37			0.19	0.79
Uniform Delay, d1					20.3		23.2	7.0			15.1	18.8
Progression Factor					1.00		0.97	1.02			1.00	1.00
Incremental Delay, d2					22.4		14.6	0.6			0.8	13.7
Delay (s)					42.8		37.0	7.7			15.9	32.6
Level of Service					D		D	A			B	C
Approach Delay (s)		0.0			42.8			15.6			30.9	
Approach LOS		A			D			B			C	

Intersection Summary			
HCM Average Control Delay	27.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	106.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95	1.00	1.00	0.95	
Frt	1.00	0.92						1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.98						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1594						3539	1583	1770	3539	
Flt Permitted	0.95	0.98						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1594						3539	1583	1770	3539	
Volume (vph)	720	0	243	0	0	0	0	101	87	860	1229	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	758	0	256	0	0	0	0	106	92	905	1294	0
RTOR Reduction (vph)	0	29	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	518	467	0	0	0	0	0	106	92	905	1294	0
Turn Type	Split								Free	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	36.5	36.5						9.1	130.0	70.3	83.6	
Effective Green, g (s)	37.1	37.1						10.4	130.0	70.5	84.9	
Actuated g/C Ratio	0.29	0.29						0.08	1.00	0.54	0.65	
Clearance Time (s)	4.6	4.6						5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	480	455						283	1583	960	2311	
v/s Ratio Prot	c0.31	0.29						0.03		c0.51	c0.37	
v/s Ratio Perm									0.06			
v/c Ratio	1.08	1.03						0.37	0.06	0.94	0.56	
Uniform Delay, d1	46.4	46.4						56.7	0.0	27.9	12.3	
Progression Factor	1.00	1.00						1.00	1.00	0.64	0.22	
Incremental Delay, d2	64.1	48.9						3.8	0.1	5.3	0.2	
Delay (s)	110.5	95.4						60.5	0.1	23.2	2.9	
Level of Service	F	F						E	A	C	A	
Approach Delay (s)		103.1			0.0			32.4			11.3	
Approach LOS		F			A			C			B	

Intersection Summary			
HCM Average Control Delay	39.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.94	0.95	1.00	0.94	0.91	0.88	1.00	0.91	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3213	3312	1482	4990	3539	1583	4713	4803	2632	1543	4433	2429
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3213	3312	1482	4990	3539	1583	4713	4803	2632	1543	4433	2429
Volume (vph)	175	439	1	1120	741	3	691	277	836	9	1349	737
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	184	462	1	1179	780	3	727	292	880	9	1420	776
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	90	0	0	237
Lane Group Flow (vph)	184	462	1	1179	780	1	727	292	790	9	1420	539
Heavy Vehicles (%)	9%	9%	9%	2%	2%	2%	8%	8%	8%	17%	17%	17%
Turn Type	Prot		Free	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	9.9	18.0	130.0	30.8	38.9	38.9	23.3	61.4	92.2	0.8	38.9	38.9
Effective Green, g (s)	10.1	19.3	130.0	31.0	40.2	40.2	23.5	62.7	93.7	1.0	40.2	40.2
Actuated g/C Ratio	0.08	0.15	1.00	0.24	0.31	0.31	0.18	0.48	0.72	0.01	0.31	0.31
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	250	492	1482	1190	1094	490	852	2317	1897	12	1371	751
v/s Ratio Prot	0.06	c0.14		c0.24	0.22		c0.15	0.06	0.10	0.01	c0.32	
v/s Ratio Perm			0.00			0.00			0.20			0.22
v/c Ratio	0.74	0.94	0.00	0.99	0.71	0.00	0.85	0.13	0.42	0.75	1.04	0.72
Uniform Delay, d1	58.6	54.8	0.0	49.4	39.8	31.0	51.6	18.5	7.2	64.4	44.9	39.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.95	0.57	1.00	1.00	1.00
Incremental Delay, d2	10.7	25.8	0.0	23.8	2.2	0.0	3.1	0.0	0.1	128.3	34.1	5.8
Delay (s)	69.4	80.6	0.0	73.1	42.0	31.0	55.3	17.7	4.1	192.6	79.0	45.7
Level of Service	E	F	A	E	D	C	E	B	A	F	E	D
Approach Delay (s)		77.2			60.7			25.8			67.7	
Approach LOS		E			E			C			E	

Intersection Summary			
HCM Average Control Delay	54.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					0.95	0.95	1.00	1.00			0.95	1.00
Frt					0.90	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.98	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1563	1504	1770	1863			3539	1583
Flt Permitted					0.98	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1563	1504	1770	1863			3539	1583
Volume (vph)	0	0	0	200	0	1056	10	811	0	0	1889	1030
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	211	0	1112	11	854	0	0	1988	1084
RTOR Reduction (vph)	0	0	0	0	60	102	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	613	548	11	854	0	0	1988	1084
Turn Type				Split		Perm	Prot					Free
Protected Phases				8	8		5	2			6	
Permitted Phases						8						Free
Actuated Green, G (s)					45.8	45.8	0.9	74.3			69.2	130.0
Effective Green, g (s)					46.4	46.4	1.1	75.6			70.5	130.0
Actuated g/C Ratio					0.36	0.36	0.01	0.58			0.54	1.00
Clearance Time (s)					4.6	4.6	4.2	5.3			5.3	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					558	537	15	1083			1919	1583
v/s Ratio Prot					c0.39		0.01	0.46			c0.56	
v/s Ratio Perm						0.36						c0.68
v/c Ratio					1.10	1.02	0.73	0.79			1.04	0.68
Uniform Delay, d1					41.8	41.8	64.3	21.0			29.8	0.0
Progression Factor					1.00	1.00	1.23	0.86			0.26	1.00
Incremental Delay, d2					67.6	44.3	39.3	1.7			25.5	1.3
Delay (s)					109.4	86.1	118.2	19.8			33.1	1.3
Level of Service					F	F	F	B			C	A
Approach Delay (s)		0.0			97.9			21.0			21.9	
Approach LOS		A			F			C			C	

Intersection Summary			
HCM Average Control Delay	40.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00	0.97	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3242	4803	1495	1687	4848	1509	3183	3113		1626	3252	1455
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3242	4803	1495	1687	4848	1509	3183	3113		1626	3252	1455
Volume (vph)	257	2084	776	157	983	139	303	404	210	156	492	41
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	271	2194	817	165	1035	146	319	425	221	164	518	43
RTOR Reduction (vph)	0	0	179	0	0	110	0	45	0	0	0	35
Lane Group Flow (vph)	271	2194	638	165	1035	36	319	601	0	164	518	8
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	10%	10%	10%	11%	11%	11%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	50.3	71.3	71.3	15.8	36.8	36.8	18.1	28.7		15.9	27.2	27.2
Effective Green, g (s)	50.5	71.9	71.9	16.0	37.4	37.4	18.3	30.0		16.1	27.8	27.8
Actuated g/C Ratio	0.34	0.48	0.48	0.11	0.25	0.25	0.12	0.20		0.11	0.19	0.19
Clearance Time (s)	4.2	4.6	4.6	4.2	4.6	4.6	4.2	5.3		4.2	4.6	4.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	1091	2302	717	180	1209	376	388	623		175	603	270
v/s Ratio Prot	0.08	c0.46		0.10	c0.21		0.10	c0.19		c0.10	0.16	
v/s Ratio Perm			0.43			0.02						0.01
v/c Ratio	0.25	0.95	0.89	0.92	0.86	0.10	0.82	0.97		0.94	0.86	0.03
Uniform Delay, d1	36.0	37.4	35.5	66.3	53.7	43.3	64.3	59.5		66.4	59.2	50.0
Progression Factor	0.94	0.92	0.86	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.0	1.3	1.8	43.6	7.9	0.5	13.1	27.3		49.5	11.7	0.0
Delay (s)	33.9	35.7	32.4	109.9	61.6	43.8	77.4	86.8		116.0	70.9	50.1
Level of Service	C	D	C	F	E	D	E	F		F	E	D
Approach Delay (s)		34.8			65.6			83.7			79.8	
Approach LOS		C			E			F			E	

Intersection Summary			
HCM Average Control Delay	54.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	2787	1770	5080		1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	2787	1770	5080		1770	3539	1583
Volume (vph)	254	73	118	44	187	157	96	2545	19	84	963	319
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	267	77	124	46	197	165	101	2679	20	88	1014	336
RTOR Reduction (vph)	0	0	94	0	0	144	0	0	0	0	0	174
Lane Group Flow (vph)	267	77	30	46	197	21	101	2699	0	88	1014	162
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	24.4	34.7	34.7	7.1	17.4	17.4	19.4	80.9		8.3	69.8	69.8
Effective Green, g (s)	24.6	36.0	36.0	7.3	18.7	18.7	19.6	82.2		8.5	71.1	71.1
Actuated g/C Ratio	0.16	0.24	0.24	0.05	0.12	0.12	0.13	0.55		0.06	0.47	0.47
Clearance Time (s)	4.2	5.3	5.3	4.2	5.3	5.3	4.2	5.3		4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	290	447	380	86	232	347	231	2784		100	1677	750
v/s Ratio Prot	c0.15	0.04		0.03	c0.11		0.06	c0.53		c0.05	0.29	
v/s Ratio Perm			0.02			0.01						0.10
v/c Ratio	0.92	0.17	0.08	0.53	0.85	0.06	0.44	0.97		0.88	0.60	0.22
Uniform Delay, d1	61.7	45.2	44.1	69.7	64.3	57.9	60.1	32.7		70.2	29.1	23.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.84	0.44		0.99	0.76	3.03
Incremental Delay, d2	32.8	0.2	0.1	6.3	24.0	0.1	0.1	1.6		47.6	1.4	0.6
Delay (s)	94.5	45.4	44.2	76.0	88.3	58.0	50.3	15.9		117.0	23.4	70.5
Level of Service	F	D	D	E	F	E	D	B		F	C	E
Approach Delay (s)		73.1			74.6			17.2			40.2	
Approach LOS		E			E			B			D	

Intersection Summary			
HCM Average Control Delay	33.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5059		1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.69	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	1770	5059		1770	3539	1583	1290	1863	1583	803	1863	1583
Volume (vph)	516	2472	88	310	1258	184	114	132	340	87	59	182
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	543	2602	93	326	1324	194	120	139	358	92	62	192
RTOR Reduction (vph)	0	3	0	0	0	68	0	0	265	0	0	167
Lane Group Flow (vph)	543	2692	0	326	1324	126	120	139	93	92	62	25
Turn Type	Prot			Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	48.3	85.2		31.8	68.7	68.7	18.2	18.2	18.2	18.2	18.2	18.2
Effective Green, g (s)	48.5	86.5		32.0	70.0	70.0	19.5	19.5	19.5	19.5	19.5	19.5
Actuated g/C Ratio	0.32	0.58		0.21	0.47	0.47	0.13	0.13	0.13	0.13	0.13	0.13
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	572	2917		378	1652	739	168	242	206	104	242	206
v/s Ratio Prot	0.31	c0.53		0.18	c0.37			0.07			0.03	
v/s Ratio Perm						0.08	0.09		0.06	c0.11		0.02
v/c Ratio	0.95	0.92		0.86	0.80	0.17	0.71	0.57	0.45	0.88	0.26	0.12
Uniform Delay, d1	49.5	28.7		56.9	34.1	23.2	62.6	61.3	60.3	64.1	58.7	57.7
Progression Factor	0.96	0.87		0.45	0.24	0.02	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.0	2.1		12.7	2.8	0.3	13.4	3.3	1.6	53.0	0.6	0.3
Delay (s)	58.3	27.1		38.4	10.8	0.8	76.0	64.6	61.9	117.2	59.3	57.9
Level of Service	E	C		D	B	A	E	E	E	F	E	E
Approach Delay (s)		32.4			14.6			65.2			73.9	
Approach LOS		C			B			E			E	

Intersection Summary			
HCM Average Control Delay	32.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95	1.00	1.00	1.00	
Frt	1.00	0.88						1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.99						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1417	1302						3312	1482	1612	1696	
Flt Permitted	0.95	0.99						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1417	1302						3312	1482	1612	1696	
Volume (vph)	738	6	520	0	0	0	0	466	365	283	511	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	777	6	547	0	0	0	0	491	384	298	538	0
RTOR Reduction (vph)	0	123	0	0	0	0	0	0	306	0	0	0
Lane Group Flow (vph)	637	570	0	0	0	0	0	491	78	298	538	0
Heavy Vehicles (%)	21%	21%	21%	2%	2%	2%	9%	9%	9%	12%	12%	12%
Turn Type	Split								Perm	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	41.3	41.3						17.3	17.3	17.7	39.2	
Effective Green, g (s)	41.9	41.9						18.2	18.2	17.9	40.1	
Actuated g/C Ratio	0.47	0.47						0.20	0.20	0.20	0.45	
Clearance Time (s)	4.6	4.6						4.9	4.9	4.2	4.9	
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	660	606						670	300	321	756	
v/s Ratio Prot	c0.45	0.44						0.15		c0.18	c0.32	
v/s Ratio Perm									0.05			
v/c Ratio	0.97	0.94						0.73	0.26	0.93	0.71	
Uniform Delay, d1	23.3	22.9						33.6	30.2	35.4	20.3	
Progression Factor	1.00	1.00						1.00	1.00	0.87	0.77	
Incremental Delay, d2	26.4	22.9						7.0	2.1	23.8	3.7	
Delay (s)	49.7	45.8						40.6	32.3	54.6	19.3	
Level of Service	D	D						D	C	D	B	
Approach Delay (s)		47.7			0.0			37.0			31.9	
Approach LOS		D			A			D			C	

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	4.0
Lane Util. Factor					1.00		1.00	0.95			1.00	1.00
Frt					0.98		1.00	1.00			1.00	0.85
Flt Protected					0.96		0.95	1.00			1.00	1.00
Satd. Flow (prot)					1571		1656	3312			1743	1482
Flt Permitted					0.96		0.95	1.00			1.00	1.00
Satd. Flow (perm)					1571		1656	3312			1743	1482
Volume (vph)	0	0	0	248	3	34	207	997	0	0	546	496
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	261	3	36	218	1049	0	0	575	522
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	0	277
Lane Group Flow (vph)	0	0	0	0	295	0	218	1049	0	0	575	245
Heavy Vehicles (%)	2%	2%	2%	14%	14%	14%	9%	9%	9%	9%	9%	9%
Turn Type				Split			Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases												6
Actuated Green, G (s)					19.9		15.0	60.6			41.4	41.4
Effective Green, g (s)					20.5		15.2	61.5			42.3	42.3
Actuated g/C Ratio					0.23		0.17	0.68			0.47	0.47
Clearance Time (s)					4.6		4.2	4.9			4.9	4.9
Vehicle Extension (s)					3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)					358		280	2263			819	697
v/s Ratio Prot					c0.19		c0.13	0.32			c0.33	
v/s Ratio Perm												0.17
v/c Ratio					0.82		0.78	0.46			0.70	0.35
Uniform Delay, d1					33.0		35.8	6.6			18.9	15.1
Progression Factor					1.00		1.05	0.33			1.00	1.00
Incremental Delay, d2					14.1		6.2	0.3			5.0	1.4
Delay (s)					47.2		43.8	2.5			23.9	16.5
Level of Service					D		D	A			C	B
Approach Delay (s)		0.0			47.2			9.6			20.4	
Approach LOS		A			D			A			C	

Intersection Summary			
HCM Average Control Delay	18.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95	1.00	1.00	0.95	
Frt	1.00	0.99						1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.96						1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1675						3539	1583	1770	3539	
Flt Permitted	0.95	0.96						1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1675						3539	1583	1770	3539	
Volume (vph)	1296	0	37	0	0	0	0	147	948	580	868	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1364	0	39	0	0	0	0	155	998	611	914	0
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	739	662	0	0	0	0	0	155	998	611	914	0
Turn Type	Split								Free	Prot		
Protected Phases	4	4						2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	48.4	48.4						10.4	120.0	47.1	61.7	
Effective Green, g (s)	49.0	49.0						11.7	120.0	47.3	63.0	
Actuated g/C Ratio	0.41	0.41						0.10	1.00	0.39	0.52	
Clearance Time (s)	4.6	4.6						5.3		4.2	5.3	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	686	684						345	1583	698	1858	
v/s Ratio Prot	c0.44	0.40						0.04		c0.35	0.26	
v/s Ratio Perm									c0.63			
v/c Ratio	1.08	0.97						0.45	0.63	0.88	0.49	
Uniform Delay, d1	35.5	34.7						51.1	0.0	33.6	18.3	
Progression Factor	1.00	1.00						1.00	1.00	0.89	0.58	
Incremental Delay, d2	57.1	26.4						4.2	1.9	5.9	0.4	
Delay (s)	92.6	61.1						55.3	1.9	35.7	11.0	
Level of Service	F	E						E	A	D	B	
Approach Delay (s)		77.7			0.0			9.1			20.9	
Approach LOS		E			A			A			C	

Intersection Summary			
HCM Average Control Delay	37.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.94	0.95	1.00	0.94	0.91	0.88	1.00	0.91	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3367	3471	1553	4990	3539	1583	4894	4988	2733	1671	4803	2632
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3367	3471	1553	4990	3539	1583	4894	4988	2733	1671	4803	2632
Volume (vph)	884	919	1290	1412	734	10	5	1220	1334	5	582	465
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	931	967	1358	1486	773	11	5	1284	1404	5	613	489
RTOR Reduction (vph)	0	0	0	0	0	8	0	0	62	0	0	372
Lane Group Flow (vph)	931	967	1358	1486	773	3	5	1284	1342	5	613	117
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	8%	8%	8%
Turn Type	Prot		Free	Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	42.3	31.7	120.0	41.0	30.4	30.4	0.8	27.5	68.5	0.8	27.5	27.5
Effective Green, g (s)	42.5	33.0	120.0	41.2	31.7	31.7	1.0	28.8	70.0	1.0	28.8	28.8
Actuated g/C Ratio	0.35	0.28	1.00	0.34	0.26	0.26	0.01	0.24	0.58	0.01	0.24	0.24
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3	4.2	5.3	4.2	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1192	955	1553	1713	935	418	41	1197	1594	14	1153	632
v/s Ratio Prot	0.28	c0.28		0.30	0.22		0.00	c0.26	0.29	0.00	0.13	
v/s Ratio Perm			c0.87			0.00			0.20			0.04
v/c Ratio	0.78	1.01	0.87	0.87	0.83	0.01	0.12	1.07	0.84	0.36	0.53	0.19
Uniform Delay, d1	34.6	43.5	0.0	36.8	41.6	32.5	59.1	45.6	20.5	59.2	39.7	36.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	0.93	1.00	1.00	1.00
Incremental Delay, d2	3.4	32.3	7.2	4.9	6.1	0.0	0.7	42.3	2.4	14.9	1.8	0.6
Delay (s)	38.0	75.8	7.2	41.8	47.6	32.6	58.2	87.9	21.4	74.1	41.5	36.9
Level of Service	D	E	A	D	D	C	E	F	C	E	D	D
Approach Delay (s)		36.4			43.7			53.2			39.6	
Approach LOS		D			D			D			D	

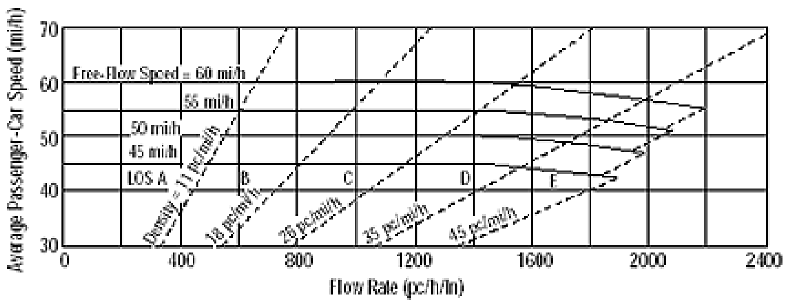
Intersection Summary			
HCM Average Control Delay	43.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	1.00
Frt					0.88	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.99	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1546	1504	1770	3539			3539	1583
Flt Permitted					0.99	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)					1546	1504	1770	3539			3539	1583
Volume (vph)	0	0	0	136	0	1010	41	1402	0	0	1312	1544
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	143	0	1063	43	1476	0	0	1381	1625
RTOR Reduction (vph)	0	0	0	0	10	10	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	626	560	43	1476	0	0	1381	1625
Turn Type				Split		Perm	Prot					Free
Protected Phases				8	8		5	2			6	
Permitted Phases						8						Free
Actuated Green, G (s)					50.6	50.6	3.4	59.5			51.9	120.0
Effective Green, g (s)					51.2	51.2	3.6	60.8			53.2	120.0
Actuated g/C Ratio					0.43	0.43	0.03	0.51			0.44	1.00
Clearance Time (s)					4.6	4.6	4.2	5.3			5.3	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					660	642	53	1793			1569	1583
v/s Ratio Prot					0.40		0.02	0.42			0.39	
v/s Ratio Perm						0.37						c1.03
v/c Ratio					0.95	0.87	0.81	0.82			0.88	1.03
Uniform Delay, d1					33.1	31.4	57.9	25.1			30.5	60.0
Progression Factor					1.00	1.00	1.43	0.07			0.58	1.00
Incremental Delay, d2					22.8	12.4	23.0	1.3			4.4	24.3
Delay (s)					55.9	43.8	105.6	3.1			22.1	84.3
Level of Service					E	D	F	A			C	F
Approach Delay (s)		0.0			50.2			6.0			55.7	
Approach LOS		A			D			A			E	

Intersection Summary			
HCM Average Control Delay	41.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	454	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	0
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.998

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	239
Speed, S (mi/h)	45.0
D (pc/mi/ln)	5.3
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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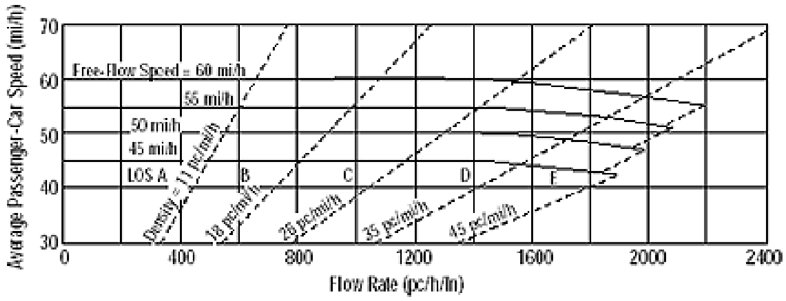
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1955	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	1
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.993

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	1036
Speed, S (mi/h)	45.0
D (pc/mi/ln)	23.0
LOS	C

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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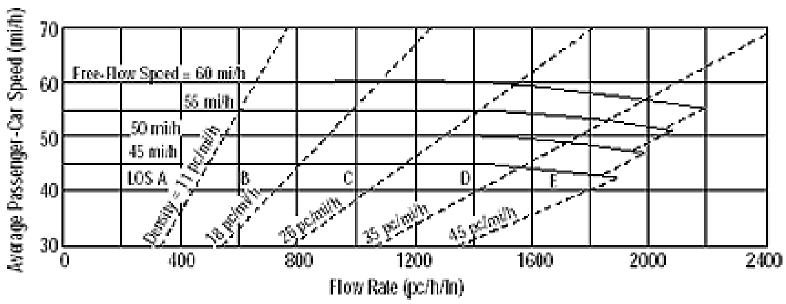
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2112	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	1130
Speed, S (mi/h)	45.0
D (pc/mi/ln)	25.1
LOS	C

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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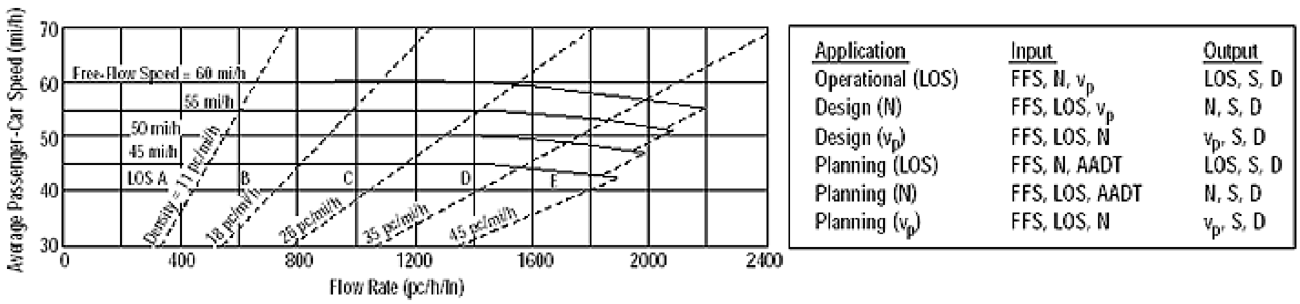
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to Paradise Cut
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1052	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	563
Speed, S (mi/h)	45.0
D (pc/mi/ln)	12.5
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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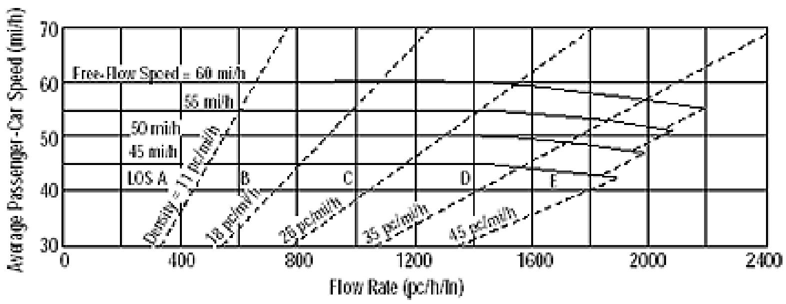
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1804	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	965
Speed, S (mi/h)	45.0
D (pc/mi/ln)	21.4
LOS	C

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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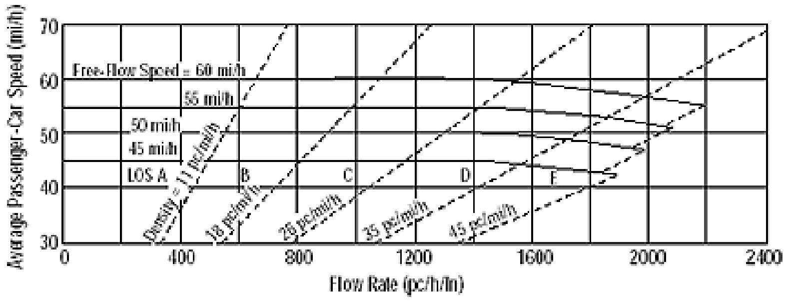
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2469	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	1321
Speed, S (mi/h)	45.0
D (pc/mi/ln)	29.4
LOS	D

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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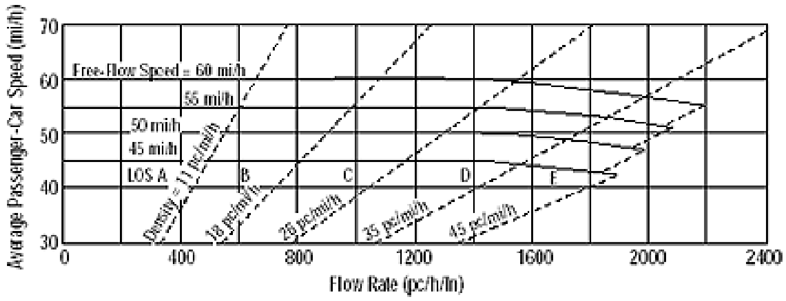
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2219	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	9
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.955

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	1222
Speed, S (mi/h)	45.0
D (pc/mi/ln)	27.2
LOS	D

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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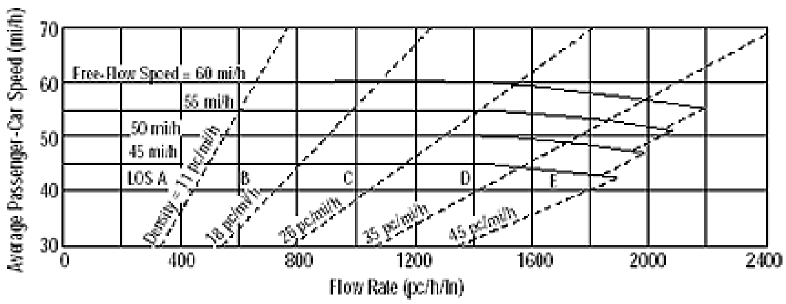
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1994	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	9
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.955

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	1098
Speed, S (mi/h)	45.0
D (pc/mi/ln)	24.4
LOS	C

Design

Design (N)

Required Number of Lanes, N
Flow Rate, v_p (pc/h)
Max Service Flow Rate (pc/h/ln)
Design LOS

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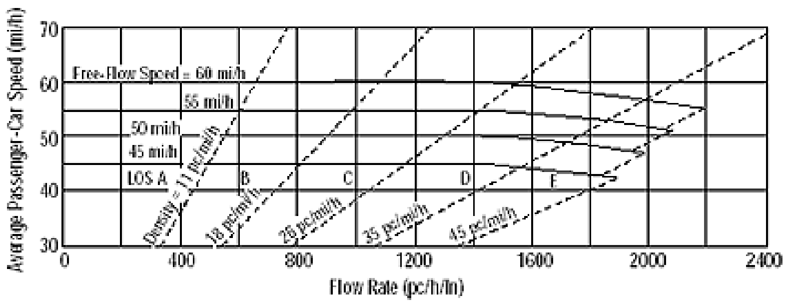
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	614	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.974

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	331
Speed, S (mi/h)	45.0
D (pc/mi/ln)	7.4
LOS	A

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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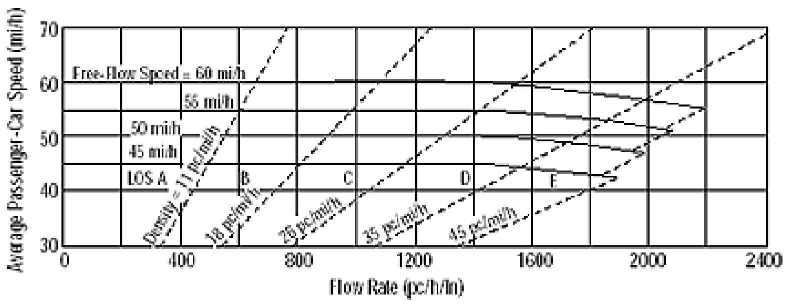
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1880	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.974

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	1016
Speed, S (mi/h)	45.0
D (pc/mi/ln)	22.6
LOS	C

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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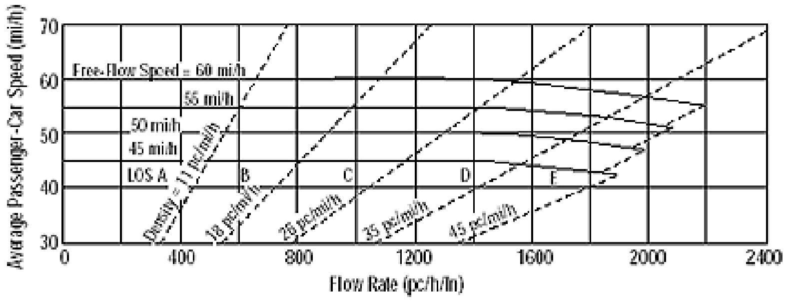
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1802	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	8
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.960

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	988
Speed, S (mi/h)	45.0
D (pc/mi/ln)	22.0
LOS	C

Design

Design (N)

Required Number of Lanes, N

Flow Rate, v_p (pc/h)

Max Service Flow Rate (pc/h/ln)

Design LOS

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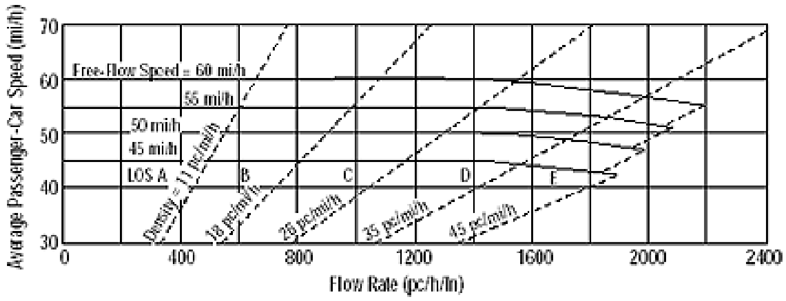
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Arbord
From/To	Paradise to MacArthur
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	910	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	8
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.960

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	499
Speed, S (mi/h)	45.0
D (pc/mi/ln)	11.1
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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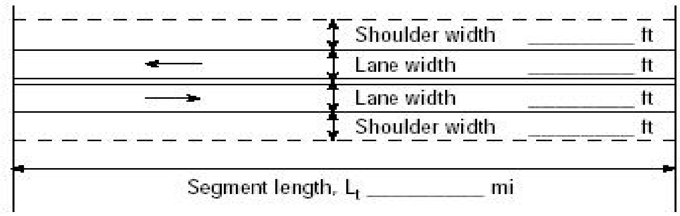
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*MacArthur Dr.*
Agency or Company	*TJKM*	From/To	*Arbor Ave. to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus proj*

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*1476* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.95*
No-passing zone	*0*
% Trucks and Buses , P_T	*17* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.983*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*1580*
v_p * highest directional split proportion[2] (pc/h)	*948*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed, $BFFS_{FM}$	*60.0 mi/h*
Field Measured speed, S_{FM}	*mi/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.2 mi/h*
Observed volume, V_f	*veh/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*55.8 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*43.5*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*1554*
v_p * highest directional split proportion[2] (pc/h)	*932*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*74.5*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*0.0*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*74.5*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*D*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.49*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*117*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*443*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*2.7*

Notes

1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.

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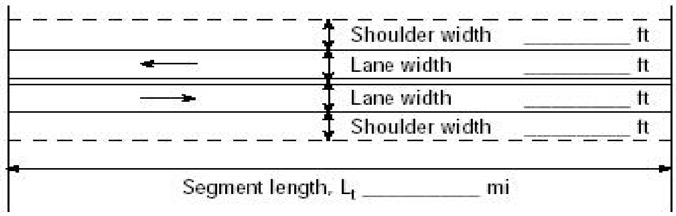
TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JL*	Highway	*MacArthur Dr.*
Agency or Company	*TJKM*	From/To	*Arbor Ave. to I-205*
Date Performed	*9/25/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus proj*

Project Description: *River Islands*

Input Data



☐ Class I highway ☑ Class II highway

Terrain ☑ Level ☐ Rolling

Two-way hourly volume	*2012* veh/h
Directional split	*60 / 40*
Peak-hour factor, PHF	*0.95*
No-passing zone	*0*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*1%*
Access points/ *mi*	*0*

Average Travel Speed

Grade adjustment factor, f_G (Exhibit 20-7)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*0.991*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*2137*
v_p * highest directional split proportion[2] (pc/h)	*1282*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM}	*mi/h*	Base free-flow speed, $BFFS_{FM}$	*45.0 mi/h*
Observed volume, V_f	*veh/h*	Adj. for lane width and shoulder width[3], f_{LS} (Exhibit 20-5)	*4.2 mi/h*
Free-flow speed, FFS FFS=S_{FM}+0.00776(V_f/ f_{HV})	*mi/h*	Adj. for access points, f_A (Exhibit 20-6)	*0.0 mi/h*
		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.8 mi/h*

Adj. for no-passing zones, f_{np} (*mi/h*) (Exhibit 20-11)	*0.0*
Average travel speed, ATS (*mi/h*) ATS=FFS-0.00776v_p-f_{np}	*24.2*

Percent Time-Spent-Following

Grade Adjustment factor, f_G (Exhibit 20-8)	*1.00*
Passenger-car equivalents for trucks, E_T (Exhibit 20-10)	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10)	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ $P_T(E_T$-1)+$P_R(E_R$-1))	*1.000*
Two-way flow rate[1], v_p (pc/h)=V/ (PHF * f_G * f_{HV})	*2118*
v_p * highest directional split proportion[2] (pc/h)	*1271*
Base percent time-spent-following, BPTSF(%)=100(1-$e^{-0.000879v_p}$)	*84.5*
Adj. for directional distribution and no-passing zone, $f_{d/hp}$(%)(Exh. 20-12)	*0.0*
Percent time-spent-following, PTSF(%)=BPTSF+$f_{d/np}$	*84.5*

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	*D*
Volume to capacity ratio, v/c=V_p/ 3,200	*0.67*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)= 0.25L_t(V/PHF)	*159*

Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=V*L_t	*604*
Peak 15-min total travel time, TT_{15}(veh-h)= VMT_{15}/ATS	*6.6*
Notes	
1. If Vp >= 3,200 pc/h, terminate analysis-the LOS is F. 2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F.	

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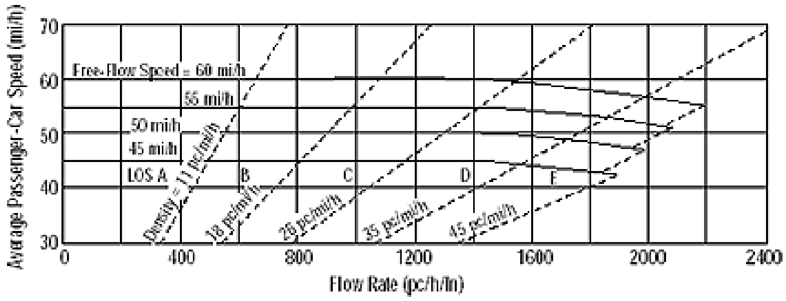
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj Miti

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1804	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	3

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	643
Speed, S (mi/h)	45.0
D (pc/mi/ln)	14.3
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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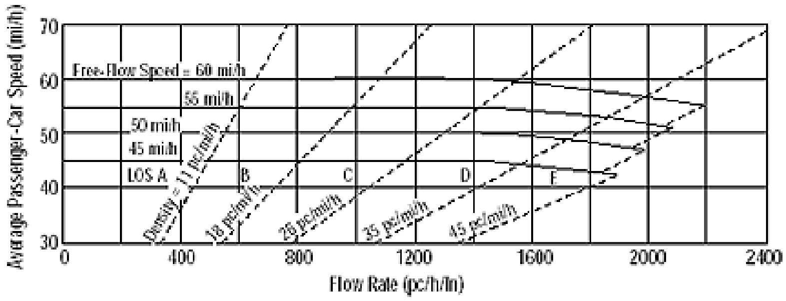
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	AM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj Miti

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2469	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	3

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.983

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	881
Speed, S (mi/h)	45.0
D (pc/mi/ln)	19.6
LOS	C

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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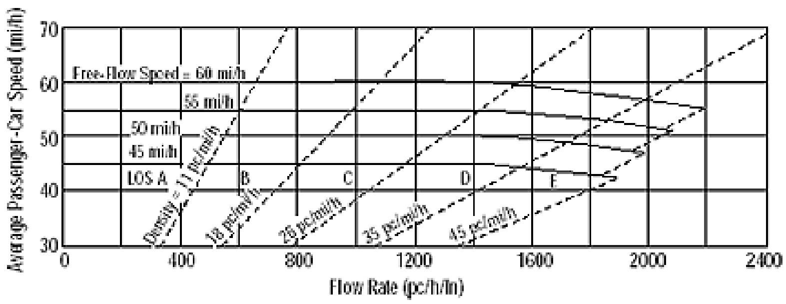
MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj Miti

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2219	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	9
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	3

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.955

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	815
Speed, S (mi/h)	45.0
D (pc/mi/ln)	18.1
LOS	C

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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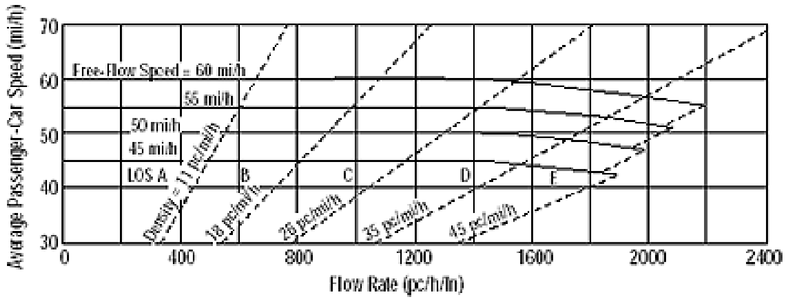
MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	
Date Performed	1/20/2010
Analysis Time Period	PM

Site Information

Highway/Direction to Travel	Paradise Rd
From/To	Arbor to I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj Miti

Project Description

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1994	Peak-Hour Factor, PHF	0.95
AADT(veh/h)		%Trucks and Buses, P_T	9
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	1
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	3

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.955

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	732
Speed, S (mi/h)	45.0
D (pc/mi/ln)	16.3
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

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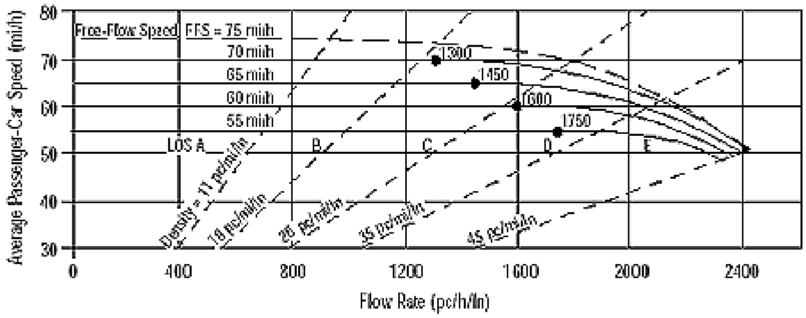
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4478*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1327*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*19.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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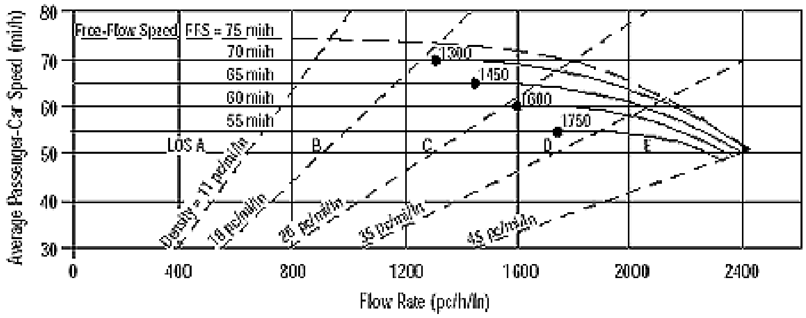
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

(Site Information)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8944*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2435*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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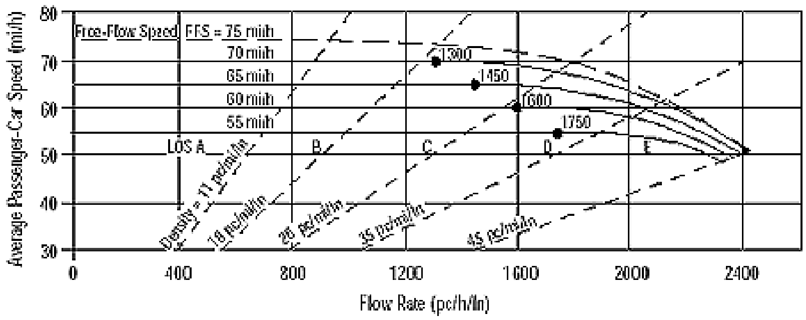
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8290*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2389*	pc/h/ln
S	*53.8*	mi/h
D = v_p / S	*44.4*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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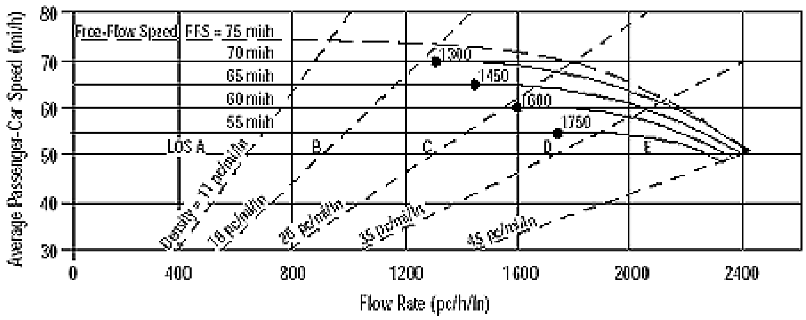
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6306*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1724*	pc/h/ln
S	*68.6*	mi/h
D = v_p / S	*25.1*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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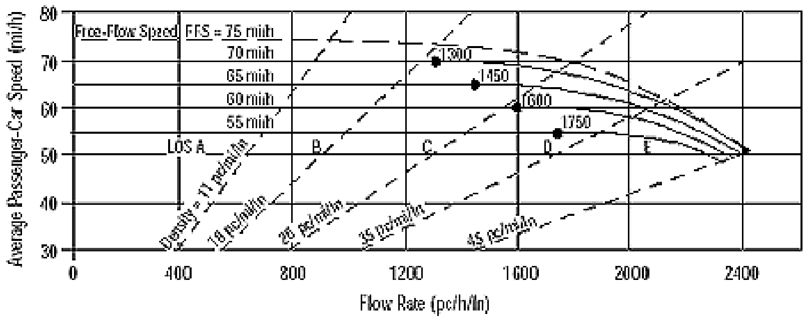

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*		
Agency or Company	*TJKM*		
Date Performed	*9/23/2009*		
Analysis Time Period	*AM Peak Hour*		

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*SR-120 & Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3929*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1164*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*16.6*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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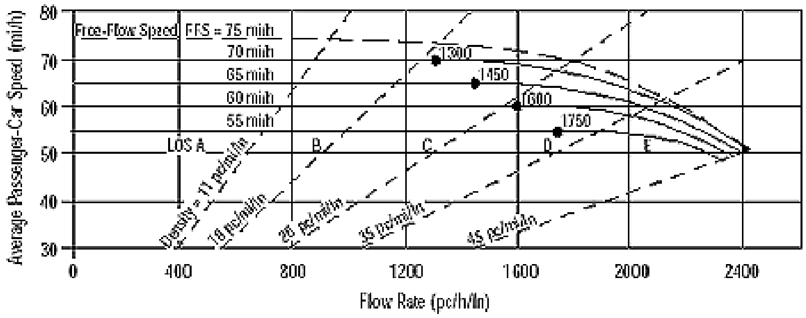

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*		
Agency or Company	*TJKM*		
Date Performed	*9/23/2009*		
Analysis Time Period	*PM Peak Hour*		

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*Louise Ave & SR-120*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7882*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2145*	pc/h/ln
S	*61.6*	mi/h
D = v_p / S	*34.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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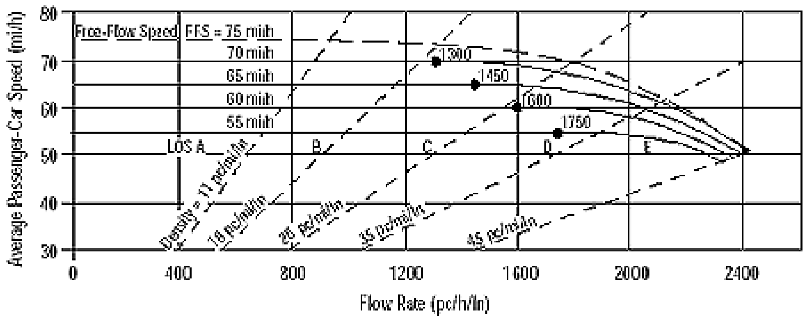
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*Louise Ave & SR-120*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7415*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2137*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.8*	mi/h	S	mi/h
D = v_p / S	*34.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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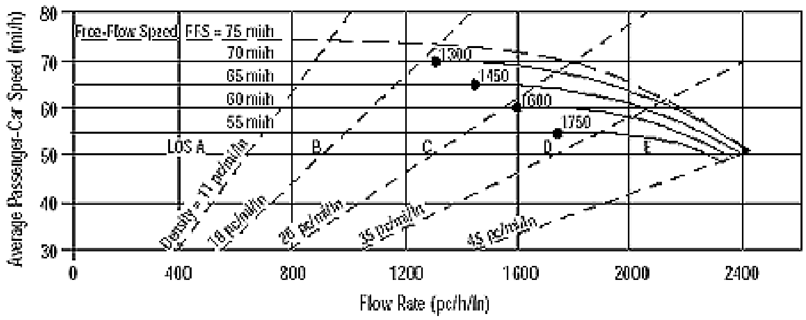
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*		
Agency or Company	*TJKM*		
Date Performed	*9/23/2009*		
Analysis Time Period	*PM Peak Hour*		

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*Louise Ave & SR-120*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5995*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1639*	pc/h/ln
S	*69.2*	mi/h
D = v_p / S	*23.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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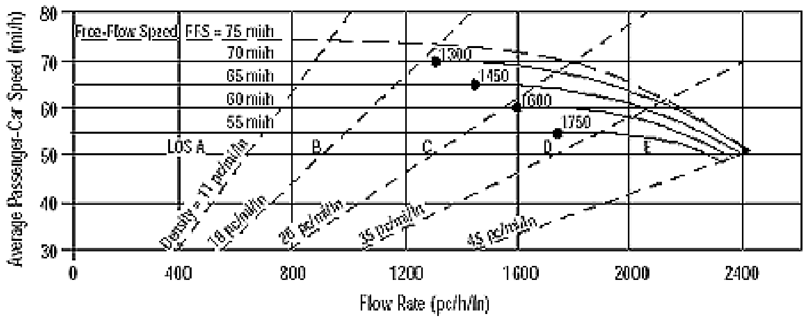
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5359*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1058*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*15.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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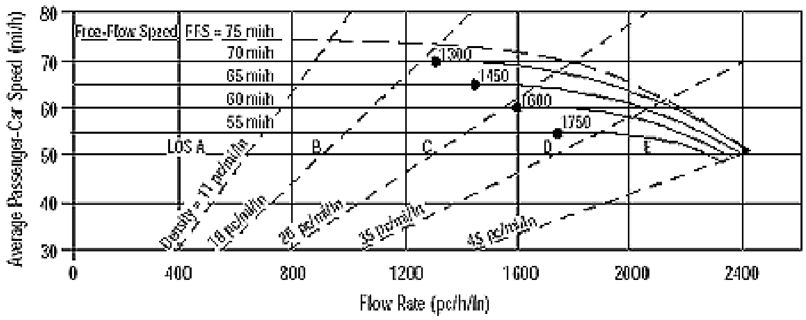
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14096*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2558*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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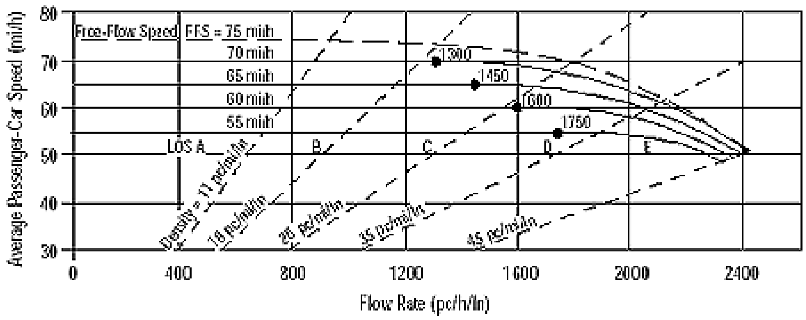
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14267*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

Operational (LOS)			Design (N)		
			Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2741*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h	S		mi/h
D = v_p / S		pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*F*		Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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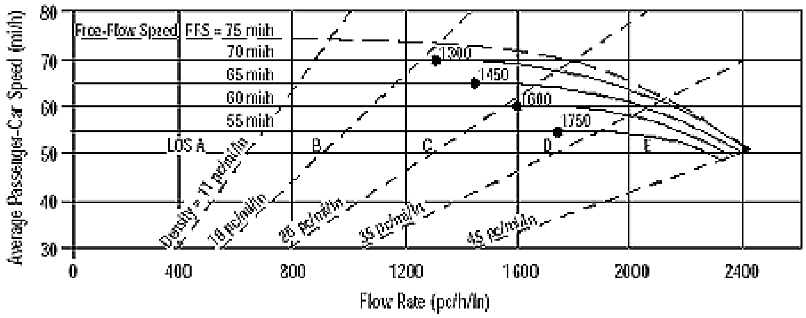
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7777*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1418*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*69.9*	mi/h	S	mi/h
D = v_p / S	*20.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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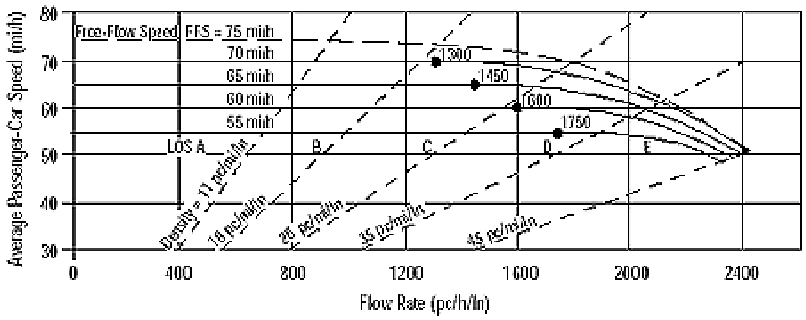
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5554*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1097*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*15.7*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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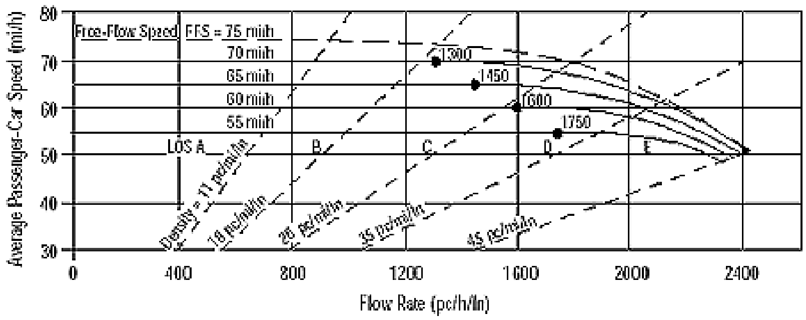
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*14397*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2613*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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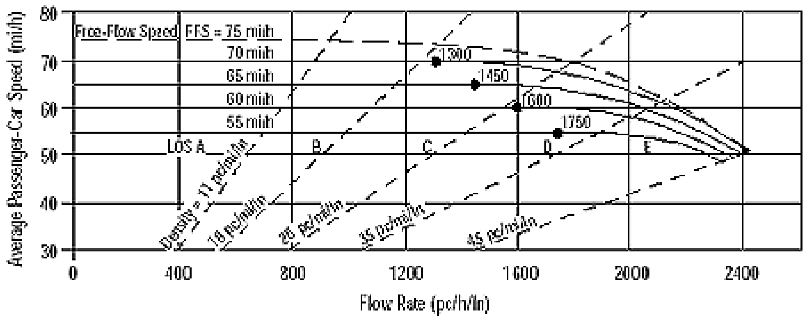
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*13166*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2529*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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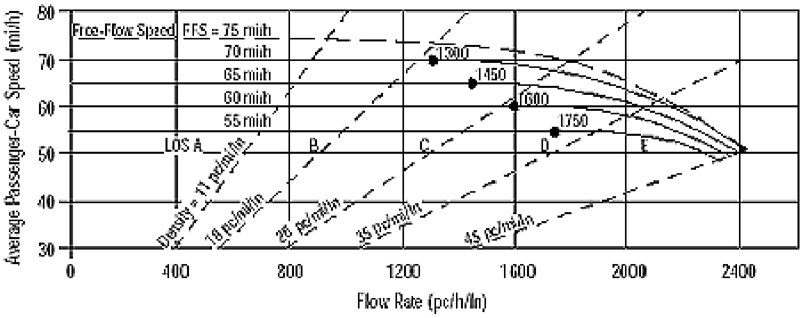
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	TJKM
Date Performed	9/23/2009
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction of Travel	I-5 SB
From/To	I-205 & Hook Ramps
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	7516	veh/h	Peak-Hour Factor, PHF	0.98
AADT		veh/day	%Trucks and Buses, P_T	14
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.933

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	6	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1370	pc/h/ln
S	70.0	mi/h
D = v_p / S	19.6	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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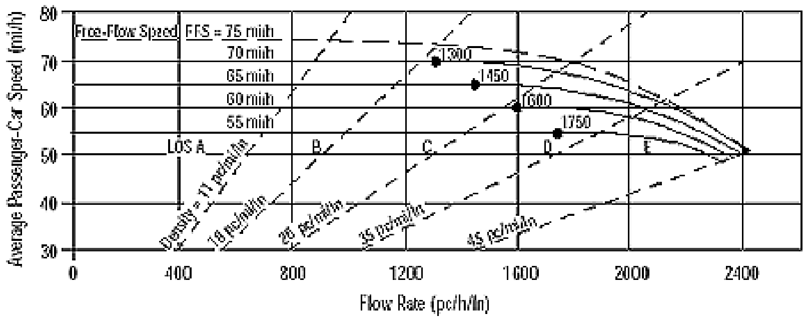
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*
Project Description			

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2612*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1032*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*14.7*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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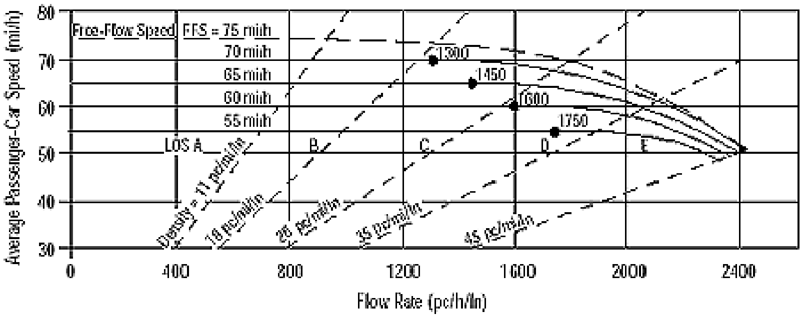
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	TJKM
Date Performed	9/23/2009
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction of Travel	I-5 NB
From/To	South of I-205
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	6171	veh/h	Peak-Hour Factor, PHF	0.98
AADT		veh/day	%Trucks and Buses, P_T	13
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.937

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	3	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	2240	pc/h/ln
S	58.9	mi/h
D = v_p / S	38.0	pc/mi/ln
LOS	E	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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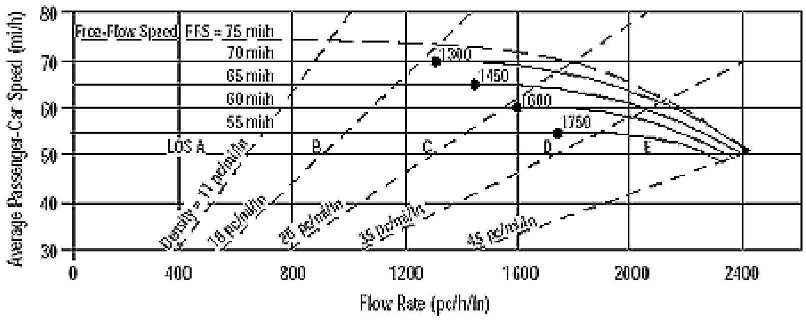
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4711*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1810*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*67.7*	mi/h	S	mi/h
D = v_p / S	*26.7*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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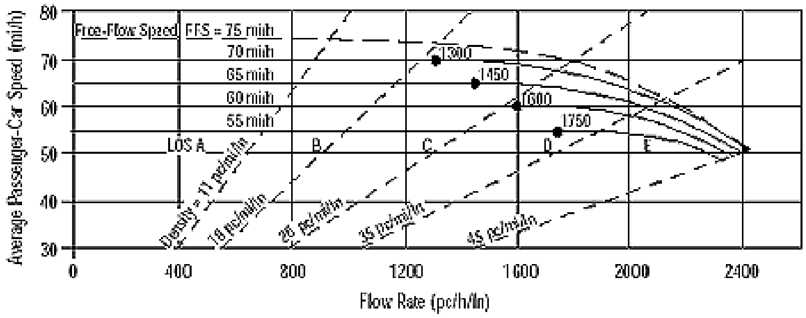
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		**Site Information**	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4329*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1578*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*69.5*	mi/h	S	mi/h
D = v_p / S	*22.7*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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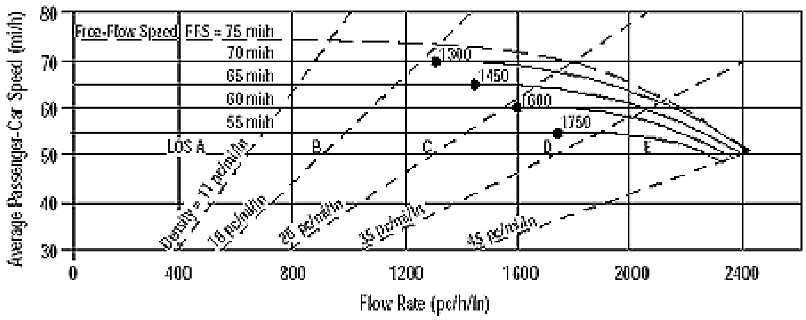
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4478*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1061*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*15.2*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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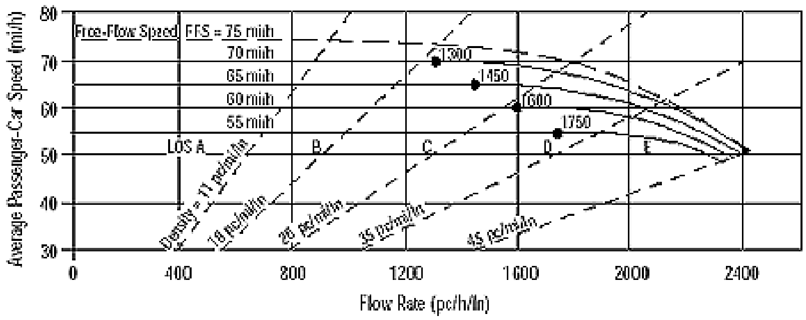
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8944*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1948*	pc/h/ln
S	*65.8*	mi/h
D = v_p / S	*29.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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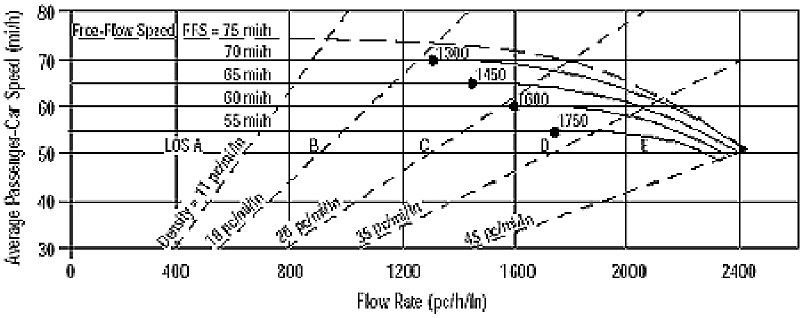
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*North of Louise Ave*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8290*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1911*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*66.4*	mi/h	S	mi/h
D = v_p / S	*28.8*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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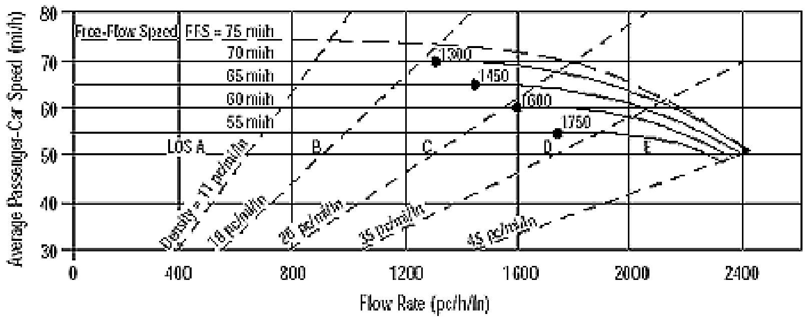
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*North of Louise Ave*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6306*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1380*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*19.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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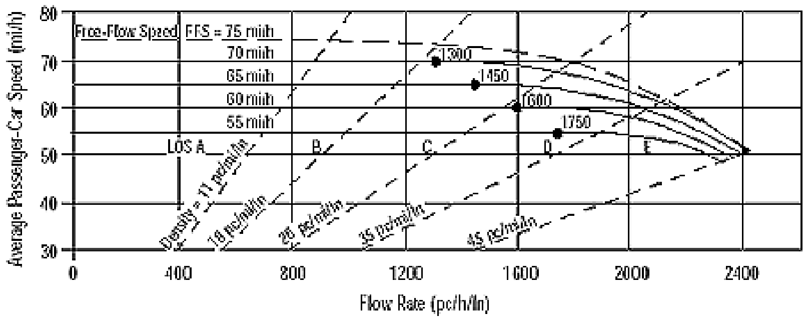
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5359*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*794*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*11.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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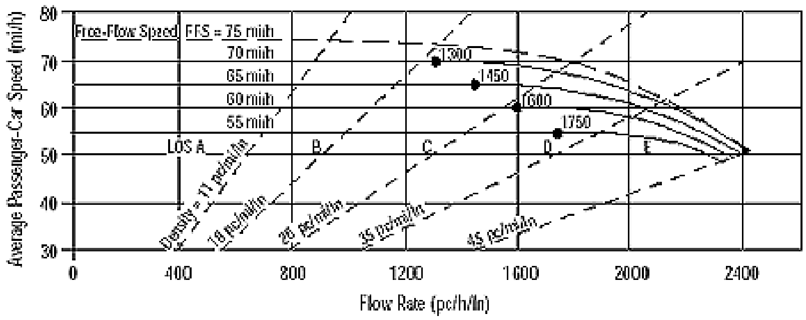

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*SR-120 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14096*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1918*	pc/h/ln
S	*66.3*	mi/h
D = v_p / S	*28.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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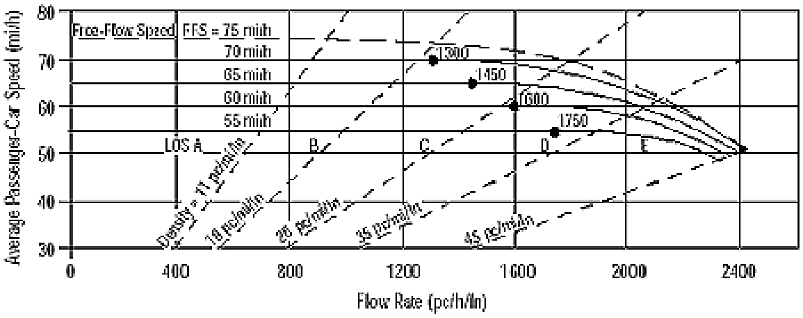

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

(Site Information in right columns)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14267*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2056*	pc/h/ln
S	*63.7*	mi/h
D = v_p / S	*32.3*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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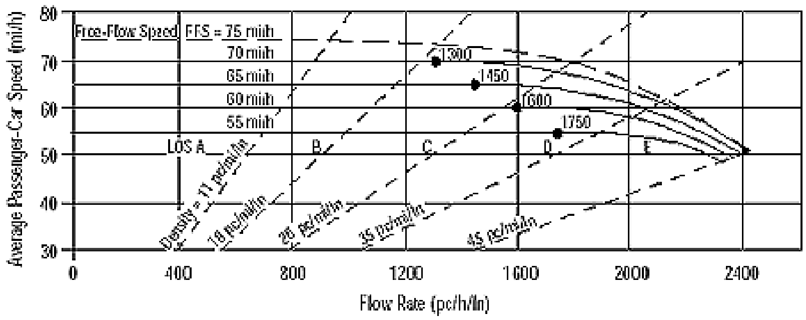
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*SR-120 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7777*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1063*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*15.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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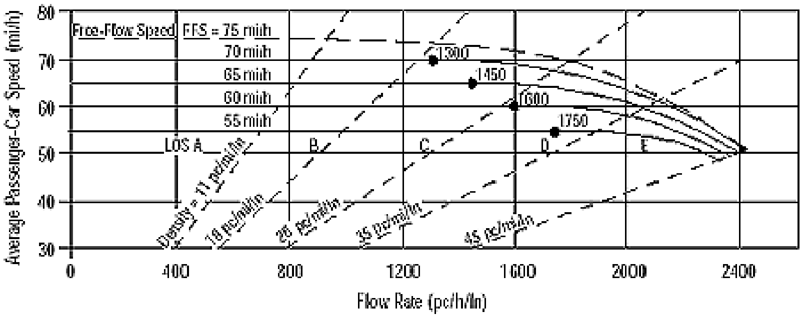

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5554*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*823*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*11.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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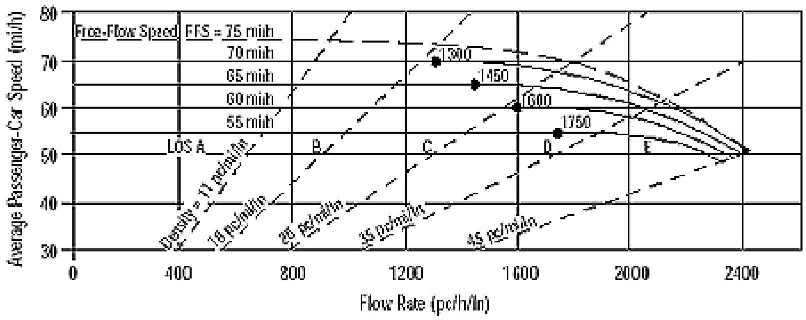
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*14397*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1959*	pc/h/ln
S	*65.6*	mi/h
D = v_p / S	*29.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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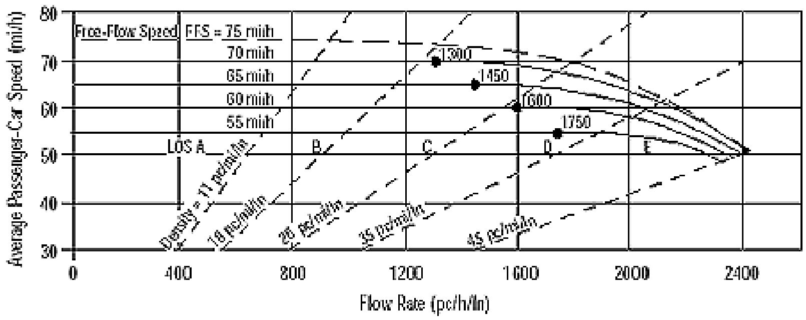
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		*Site Information*	
Analyst	*JL*	Highway/Direction of Travel	*I-5 SB*
Agency or Company	*TJKM*	From/To	*I-205 & Hook Ramps*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 Plus Proj Miti*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*13166*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*8*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1897*	pc/h/ln
S	*66.6*	mi/h
D = v_p / S	*28.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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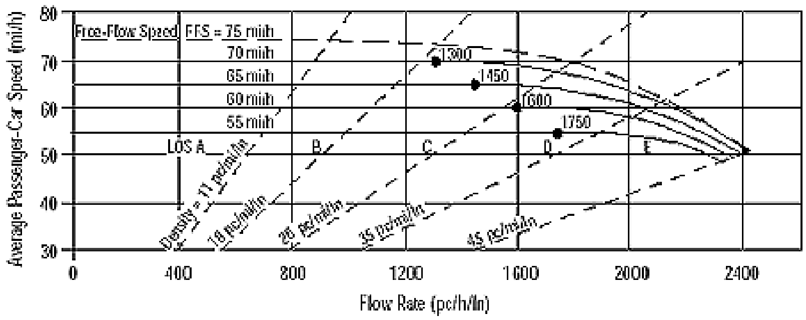
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*I-205 & Hook Ramps*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7516*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*8*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1028*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*14.7*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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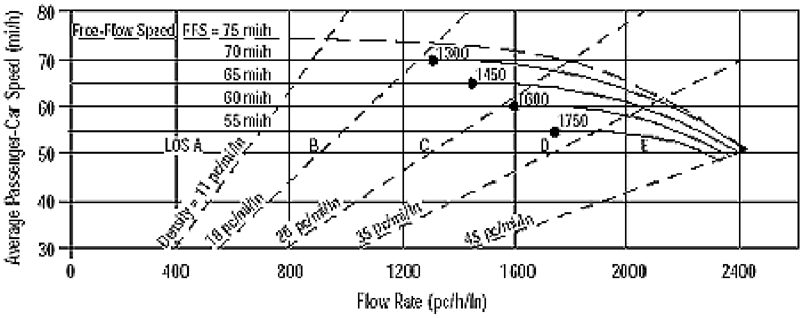
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-5 NB*
Agency or Company	*TJKM*	From/To	*South of I-205*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2612*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.907*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*774*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*11.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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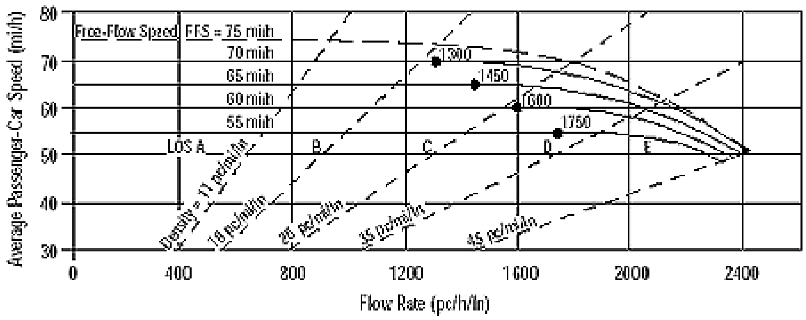
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 NB*
From/To	*South of I-205*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6171*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.937*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1680*	pc/h/ln
S	*68.9*	mi/h
D = v_p / S	*24.4*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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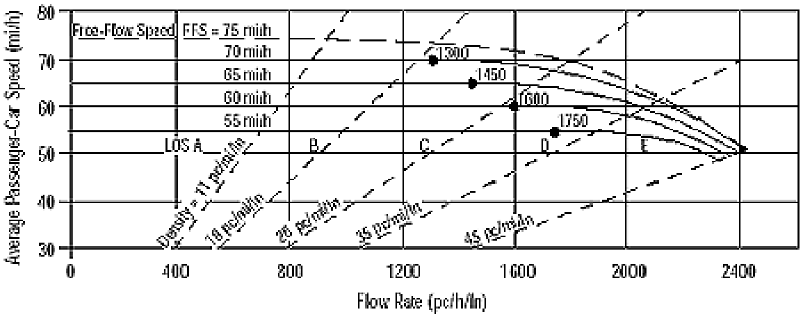
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*South of I-205*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4711*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1810*	pc/h/ln
S	*67.7*	mi/h
D = v_p / S	*26.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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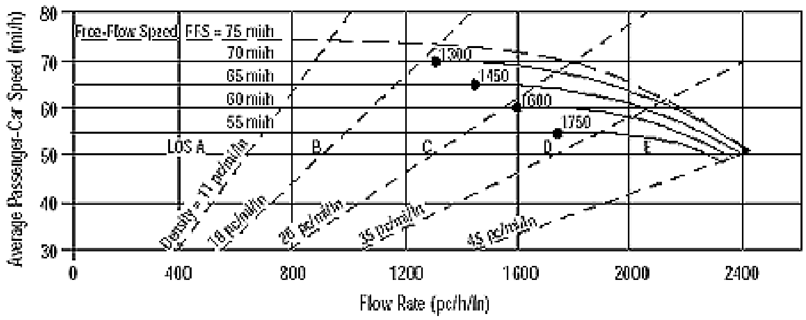
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-5 SB*
From/To	*South of I-205*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4329*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.933*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1578*	pc/h/ln
S	*69.5*	mi/h
D = v_p / S	*22.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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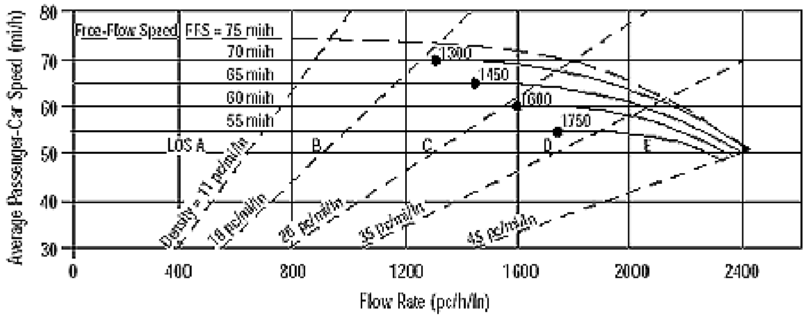
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3259*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*923*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*13.2*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits23-8, 23-10
f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11
f_{LC} - Exhibit 23-5
f_p - Page 23-12
f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{ID} - Exhibit 23-7

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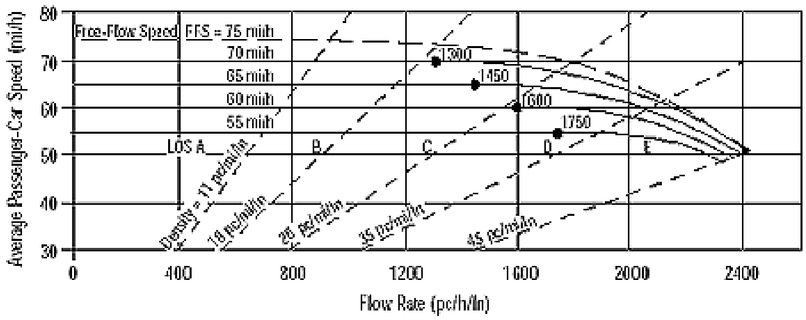
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 & Paradise*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8977*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2436*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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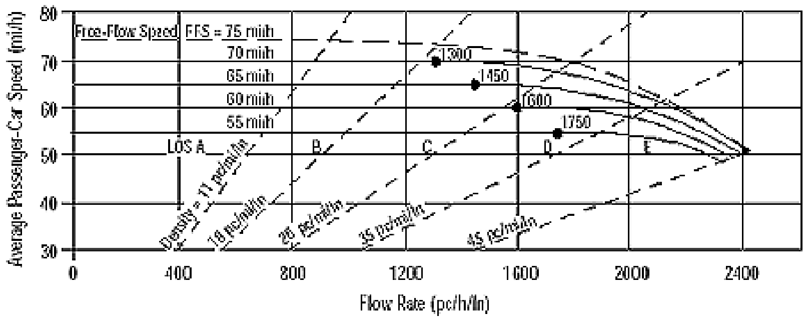
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8772*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2426*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits23-8, 23-10
- E_T - Exhibits 23-8, 23-10, 23-11
- f_p - Page 23-12
- LOS, S, FFS, v_p - Exhibits 23-2, 23-3
- f_{LW} - Exhibit 23-4
- f_{LC} - Exhibit 23-5
- f_N - Exhibit 23-6
- f_{ID} - Exhibit 23-7

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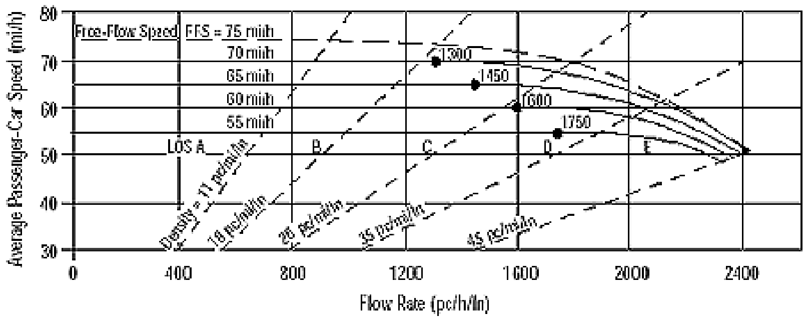
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3938*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1079*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*15.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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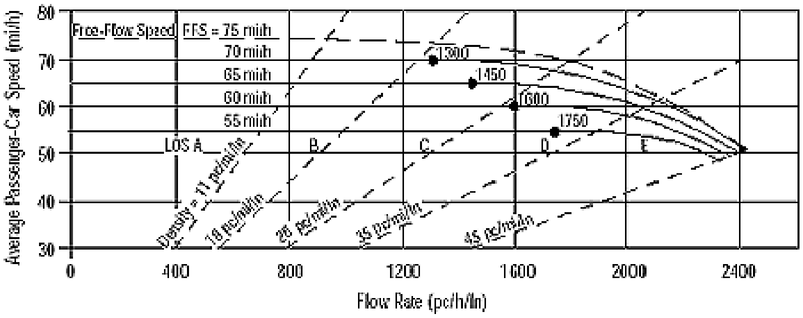
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*d*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*Paradise and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3802*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1076*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*15.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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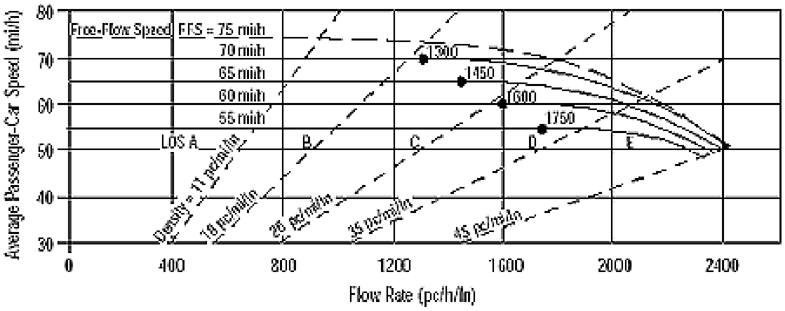
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*Paradise Ave & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9366*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2542*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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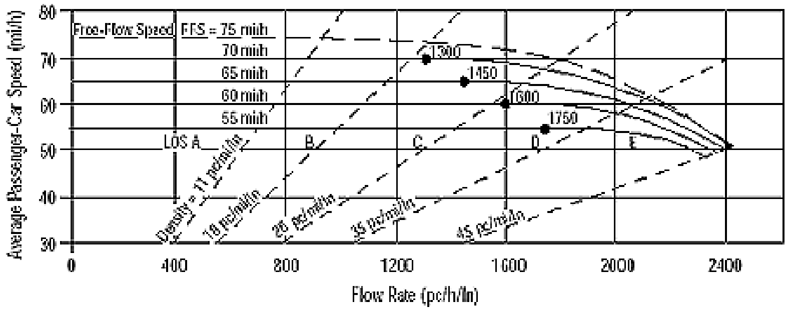
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*Paradise Ave & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9695*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2681*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits23-8, 23-10
- E_T - Exhibits 23-8, 23-10, 23-11
- f_p - Page 23-12
- LOS, S, FFS, v_p - Exhibits 23-2, 23-3
- f_{LW} - Exhibit 23-4
- f_{LC} - Exhibit 23-5
- f_N - Exhibit 23-6
- f_{ID} - Exhibit 23-7

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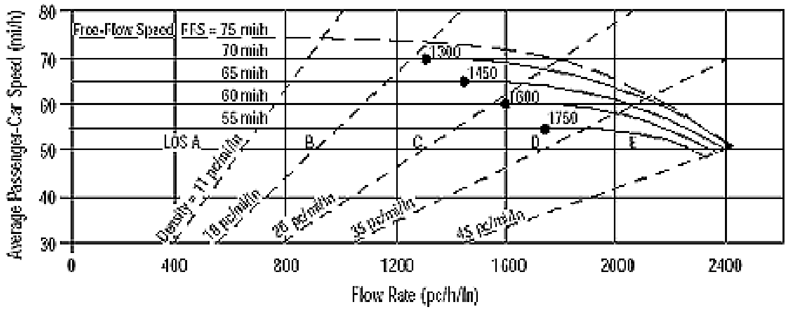
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*Paradise Ave & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4757*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1303*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*18.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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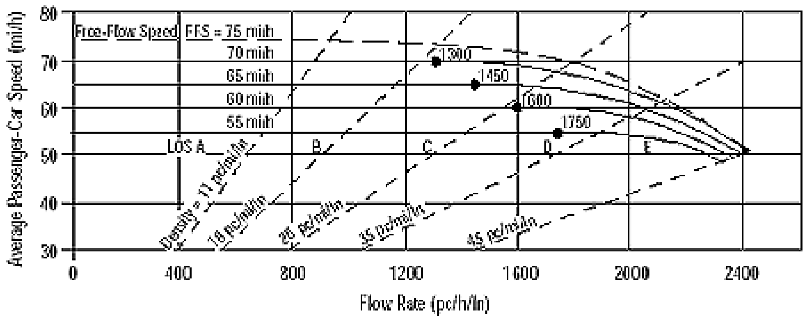
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*d*		
Agency or Company	*TJKM*		
Date Performed	*9/23/2009*		
Analysis Time Period	*AM Peak Hour*		

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3966*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1123*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*16.0*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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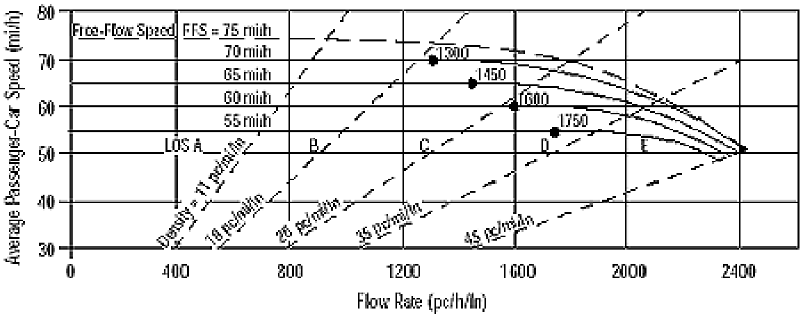
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*10020*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2719*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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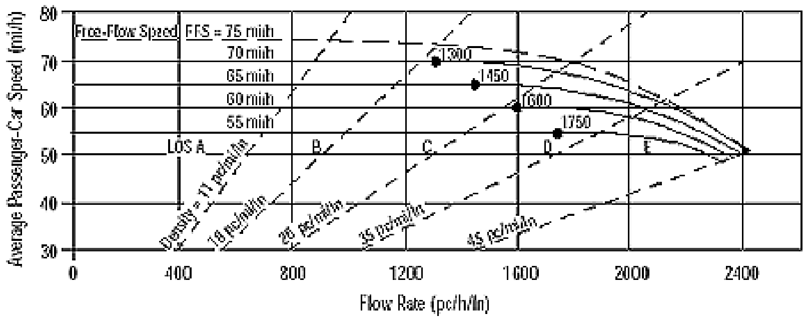
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*10345*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2861*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S		mi/h	S	mi/h
D = v_p / S		pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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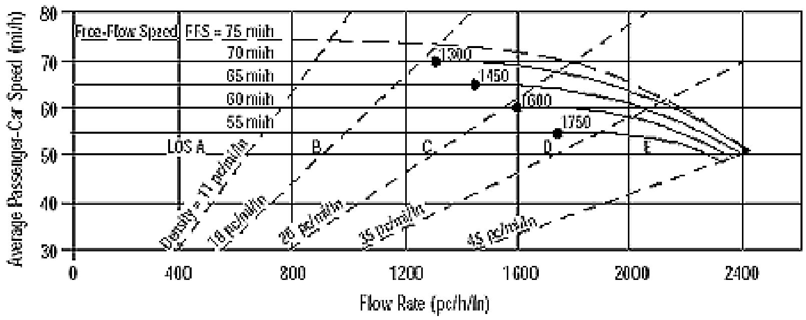
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

(Site Information in right columns)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5078*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*4*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1391*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*19.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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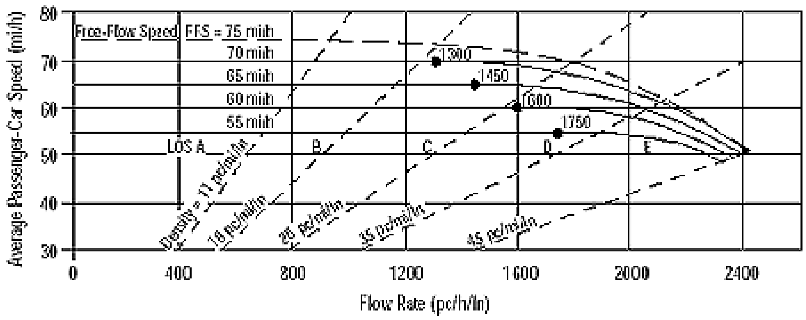
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 and Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3259*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*738*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*10.5*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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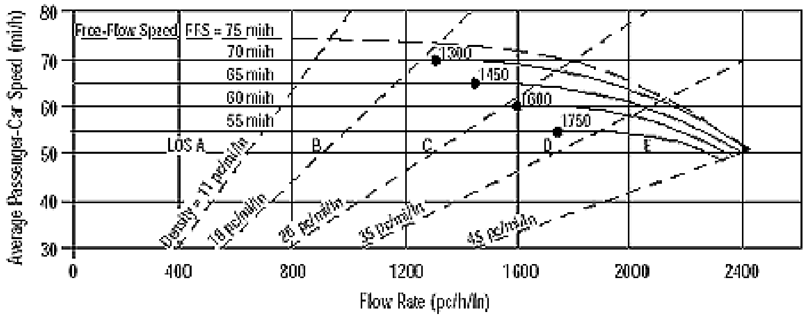
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*I-5 & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*10020*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1813*	pc/h/ln
S	*67.7*	mi/h
D = v_p / S	*26.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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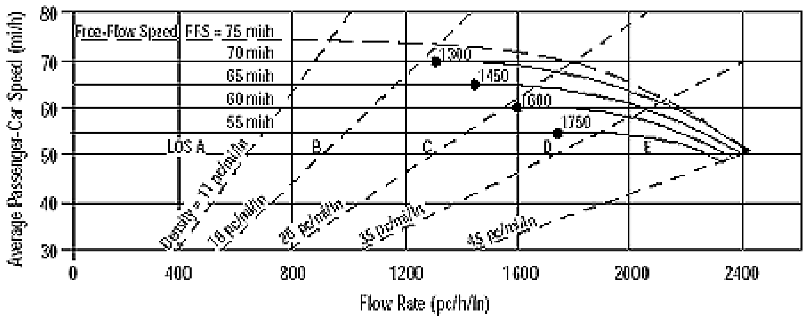
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

(Site Information in right columns)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*10345*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*6*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1907*	pc/h/ln
S	*66.4*	mi/h
D = v_p / S	*28.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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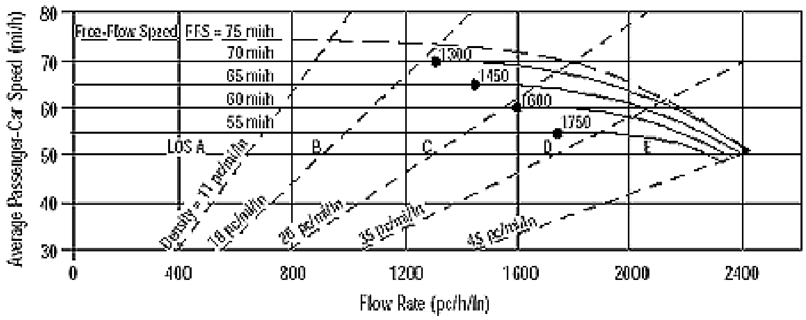
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*I-5 & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5078*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs / Calc Speed Adj and FFS

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures / Design (N)

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*927*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*13.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary / Factor Location

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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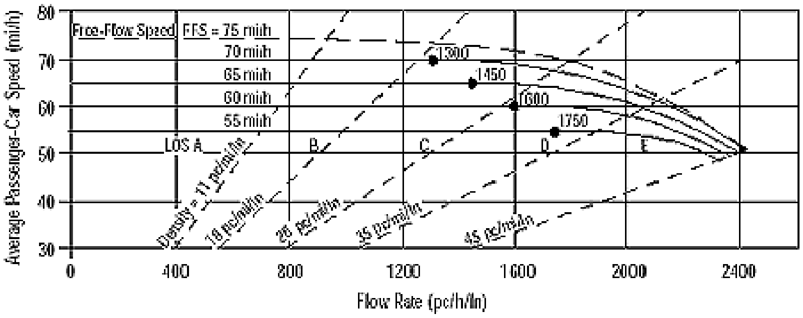
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 & Paradise*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*8977*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1949*	pc/h/ln
S	*65.8*	mi/h
D = v_p / S	*29.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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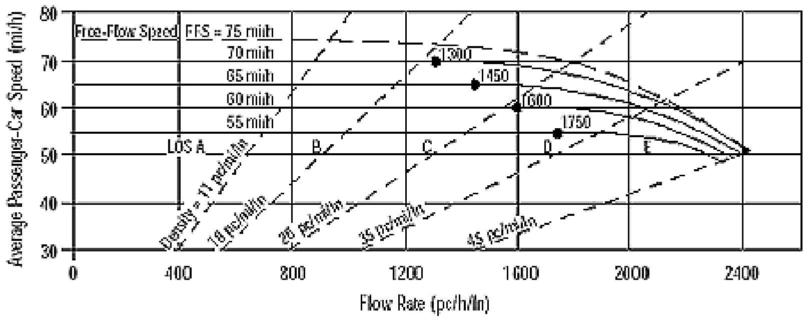
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	JL
Agency or Company	TJKM
Date Performed	9/23/2009
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction of Travel	I-205 WB
From/To	I-5 & Paradise
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj Mitigated

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	8772	veh/h	Peak-Hour Factor, PHF	0.96
AADT		veh/day	%Trucks and Buses, P_T	12
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.942

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	5	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1941	pc/h/ln
S	65.9	mi/h
D = v_p / S	29.5	pc/mi/ln
LOS	D	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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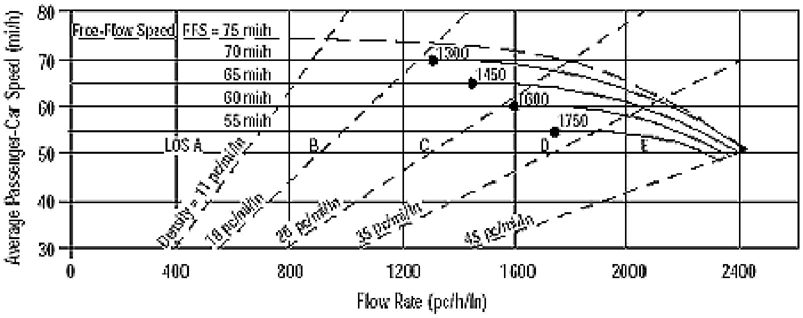
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*I-5 & Paradise*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3938*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*863*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*12.3*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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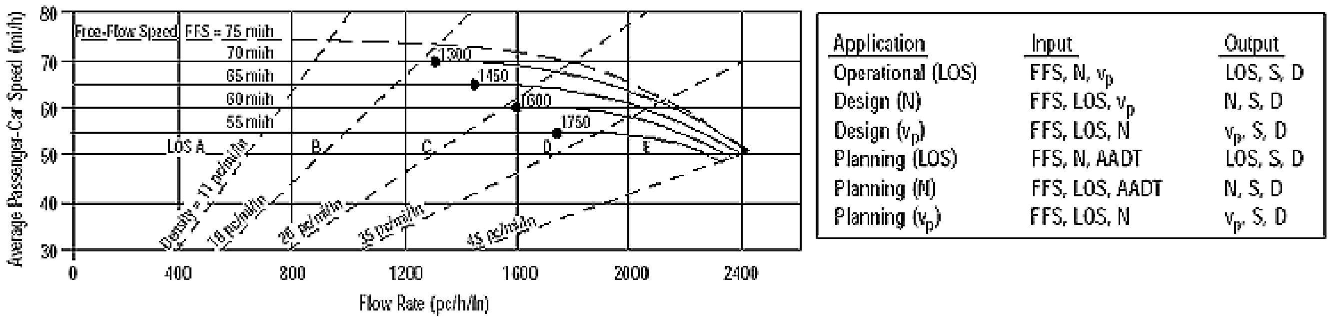
BASIC FREEWAY SEGMENTS WORKSHEET



General Information

Analyst	d
Agency or Company	TJKM
Date Performed	9/23/2009
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction of Travel	I-205 EB
From/To	Paradise and MacArthur Drive
Jurisdiction	Lathrop
Analysis Year	2031 plus Proj Mitigated

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	3802	veh/h	Peak-Hour Factor, PHF	0.96
AADT		veh/day	%Trucks and Buses, P_T	17
Peak-Hr Prop. of AADT, K			%RVs, P_R	1
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
Driver type adjustment	1.00		Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.920

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	5	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	861	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.3	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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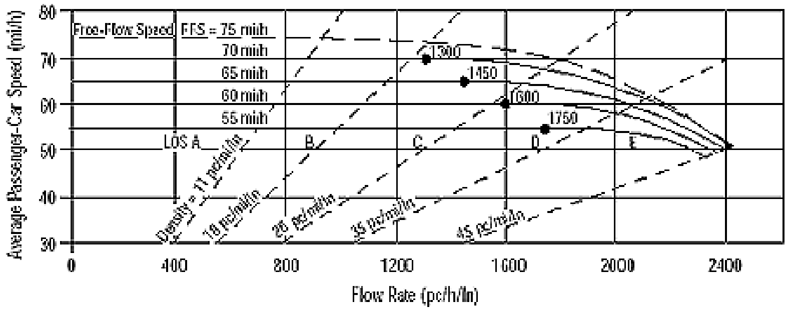
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 EB*
From/To	*Paradise Ave & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9366*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2033*	pc/h/ln
S	*64.2*	mi/h
D = v_p / S	*31.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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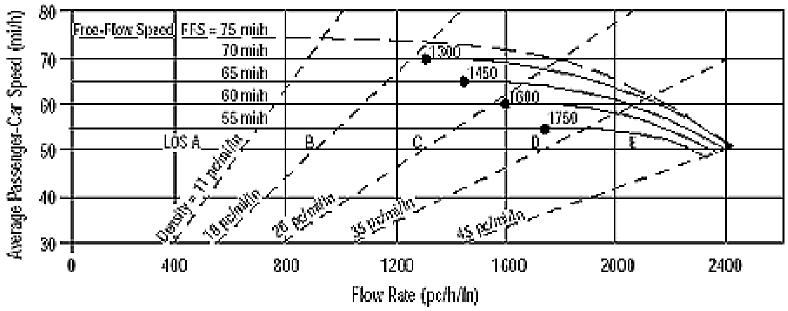
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		Site Information	
Analyst	*JL*	Highway/Direction of Travel	*I-205 WB*
Agency or Company	*TJKM*	From/To	*Paradise Ave & MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*9695*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.942*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2145*	pc/h/ln
S	*61.6*	mi/h
D = v_p / S	*34.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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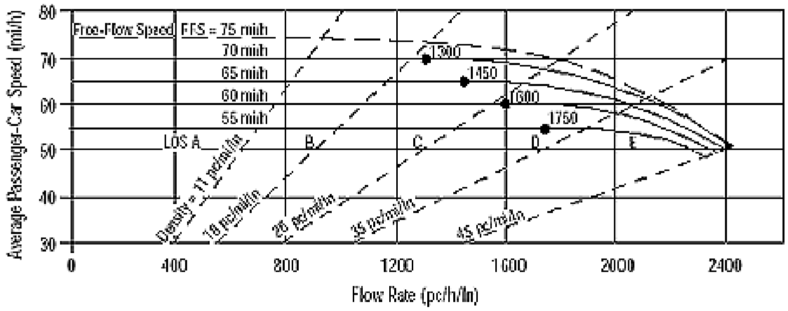
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-205 WB*
From/To	*Paradise Ave & MacArthur Drive*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4757*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.951*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*5*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1043*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*14.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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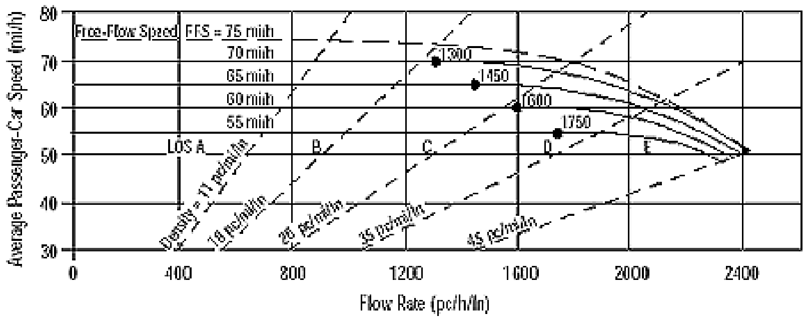
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		**Site Information**	
Analyst	*d*	Highway/Direction of Travel	*I-205 EB*
Agency or Company	*TJKM*	From/To	*I-5 and MacArthur Drive*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3966*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*17*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.920*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*6*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*748*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*10.7*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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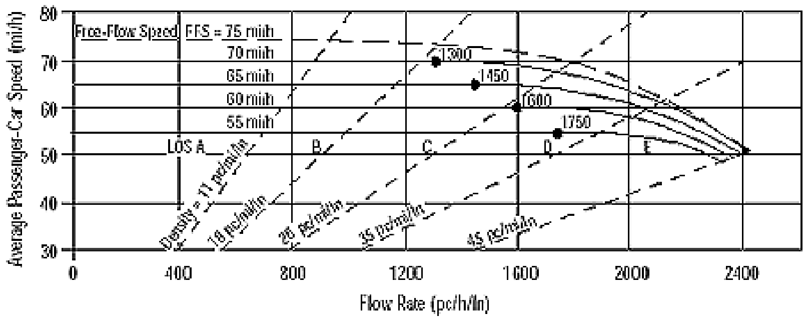
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*JL*	Highway/Direction of Travel	*SR-120 EB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1668*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*16*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.924*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
<u>Operational (LOS)</u>			<u>Design (N)</u>	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*691*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*9.9*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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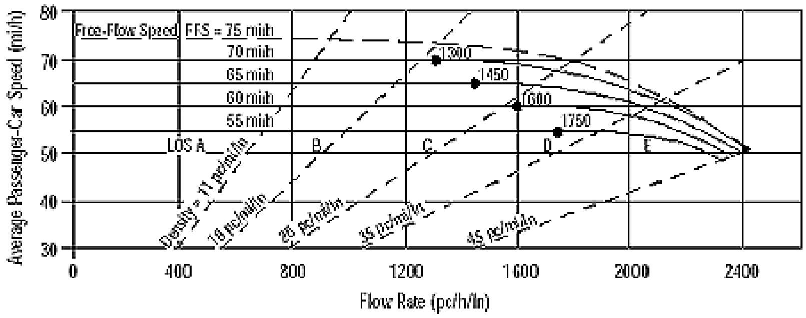
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*SR-120 EB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7035*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.964*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*3*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2533*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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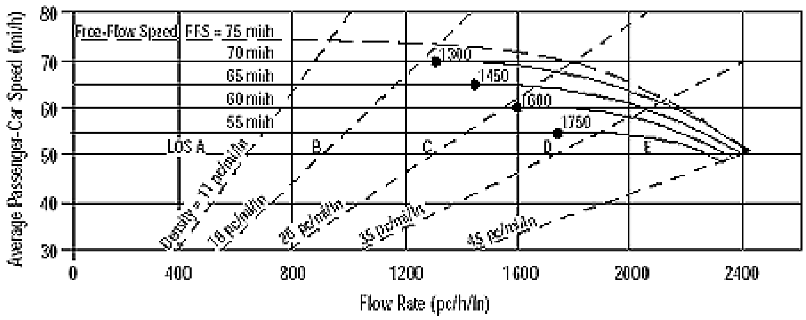
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*	Highway/Direction of Travel	*SR-120 WB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj*

(Site Information in right columns)

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7090*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*11*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.946*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2871*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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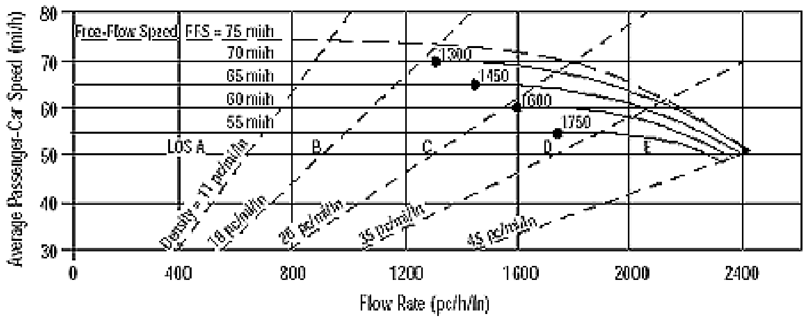
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 WB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2603*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*3*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*942*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*13.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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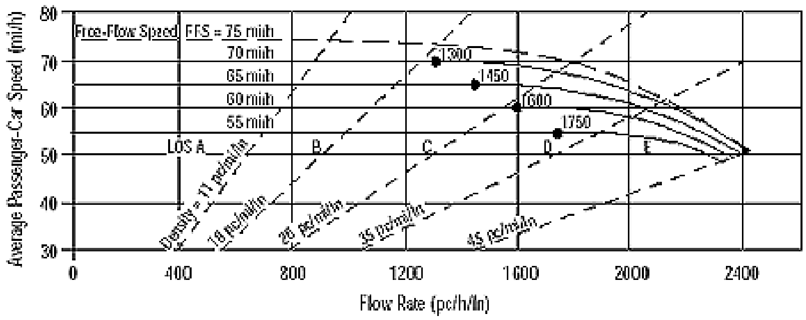
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 EB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1668*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*16*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.924*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*519*	pc/h/ln
S	*70.0*	mi/h
D = v_p / S	*7.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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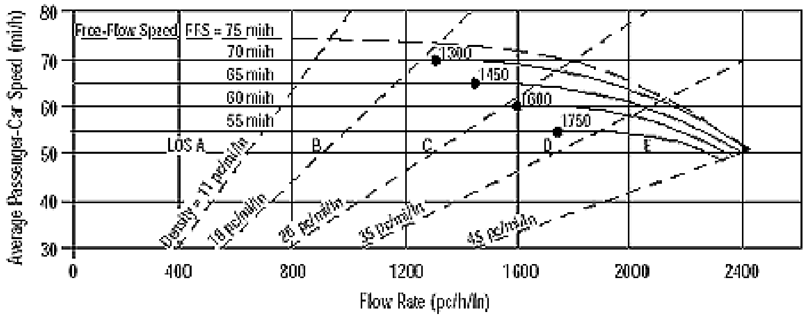
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*JL*
Agency or Company	*TJKM*
Date Performed	*9/23/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*SR-120 EB*
From/To	*East of I-5*
Jurisdiction	*Lathrop*
Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7035*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.964*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*0.50*	I/mi
Number of Lanes, N	*4*	
FFS (measured)	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	*70.0*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1900*	pc/h/ln
S	*66.6*	mi/h
D = v_p / S	*28.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits23-8, 23-10
- E_T - Exhibits 23-8, 23-10, 23-11
- f_p - Page 23-12
- LOS, S, FFS, v_p - Exhibits 23-2, 23-3
- f_{LW} - Exhibit 23-4
- f_{LC} - Exhibit 23-5
- f_N - Exhibit 23-6
- f_{ID} - Exhibit 23-7

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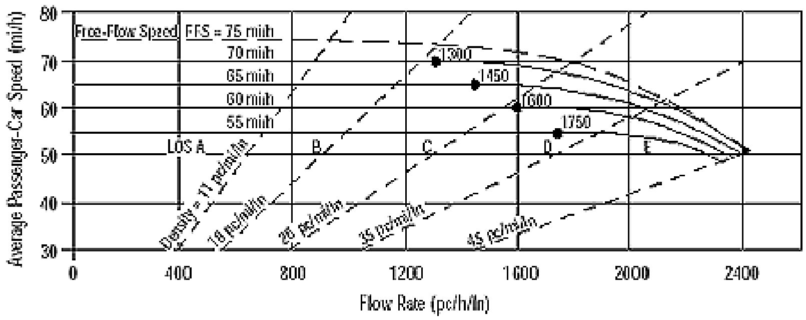
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	*JL*	Highway/Direction of Travel	*SR-120 WB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*7090*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*11*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.946*

Speed Inputs / Calc Speed Adj and FFS

Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1723*	pc/h/ln
S	*68.6*	mi/h
D = v_p / S	*25.1*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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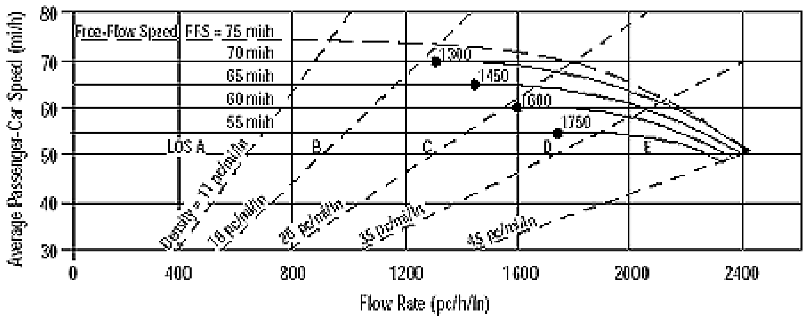
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		**Site Information**	
Analyst	*JL*	Highway/Direction of Travel	*SR-120 WB*
Agency or Company	*TJKM*	From/To	*East of I-5*
Date Performed	*9/23/2009*	Jurisdiction	*Lathrop*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2031 plus Proj Mitigated*

Project Description

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2603*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.960*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}		mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}		mi/h
Interchange Density	*0.50*	I/mi	f_{ID}		mi/h
Number of Lanes, N	*5*		f_N		mi/h
FFS (measured)	*70.0*	mi/h	FFS	*70.0*	mi/h
Base free-flow Speed, BFFS		mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*565*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*70.0*	mi/h	S	mi/h
D = v_p / S	*8.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2900 ft

V_u = 1067 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3929	0.95	Level	20	1	0.907	1.00	4558
Ramp	737	0.95	Level	18	1	0.916	1.00	847
UpStream	1067	0.95	Level	8	1	0.960	1.00	1170
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 743 pc/h

V_3 or V_{av34} 1406 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1422 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4403	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2269	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 18.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.313 (Exibit 25-19)

S_R= 50.9 mph (Exhibit 25-19)

S_0= 53.0 mph (Exhibit 25-19)

S = 51.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2900 ft

V_u = 1475 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	7882	0.95	Level	13	1	0.937	1.00	8853
Ramp	1657	0.95	Level	9	1	0.955	1.00	1826
UpStream	1475	0.95	Level	6	1	0.969	1.00	1602
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1328 pc/h

V_3 or V_{av34} 2512 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2541 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8179	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4367	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 34.6 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.582 (Exibit 25-19)

S_R= 47.4 mph (Exhibit 25-19)

S_0= 49.9 mph (Exhibit 25-19)

S = 48.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 1000 ft

V_D = 737 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4478	0.95	Level	19	1	0.912	1.00	5171
Ramp	1067	0.95	Level	8	1	0.960	1.00	1170
UpStream								
DownStream	737	0.95	Level	18	1	0.916	1.00	847

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 843 pc/h

V_3 or V_{av34} 1595 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1613 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5204	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2783	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 21.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.327 (Exibit 25-19)

S_R= 50.7 mph (Exhibit 25-19)

S_0= 52.4 mph (Exhibit 25-19)

S = 51.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 NB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 1000 ft

V_D = 7882 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	8944	0.95	Level	12	1	0.942	1.00	9998
Ramp	1475	0.95	Level	6	1	0.969	1.00	1602
UpStream								
DownStream	7882	0.95	Level	9	1	0.955	1.00	8687

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1567 pc/h

V_3 or V_{av34} 2965 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2999 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	9100	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4601	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 35.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.653 (Exibit 25-19)

S_R= 46.5 mph (Exhibit 25-19)

S_0= 48.7 mph (Exhibit 25-19)

S = 47.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2785 ft

V_u = 1715 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	8290	0.95	Level	14	1	0.933	1.00	9355
Ramp	2371	0.95	Level	9	1	0.955	1.00	2613
UpStream	1715	0.95	Level	13	1	0.937	1.00	1926
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1433 pc/h

V_3 or V_{av34} 2711 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2742 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	9468	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5355	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 41.2 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.092 (Exibit 25-19)

S_R= 40.8 mph (Exhibit 25-19)

S_0= 49.4 mph (Exhibit 25-19)

S = 44.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	374	Freeway/Dir of Travel	I-5 SB Off
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2785 ft

V_u = 2423 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	6306	0.95	Level	13	1	0.937	1.00	7083
Ramp	1491	0.95	Level	8	1	0.960	1.00	1635
UpStream	2423	0.95	Level	16	1	0.924	1.00	2760
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1081 pc/h

V_3 or V_{av34} 2045 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2068 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6806	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3703	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 28.7 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.425 (Exibit 25-19)

S_R= 49.5 mph (Exhibit 25-19)

S_0= 51.2 mph (Exhibit 25-19)

S = 50.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 2785 ft

V_u = 2371 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	7415	0.95	Level	14	1	0.933	1.00	8367
Ramp	1715	0.95	Level	13	1	0.937	1.00	1926
UpStream	2371	0.95	Level	9	1	0.955	1.00	2613
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1250 pc/h

V_3 or V_{av34} 2366 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2393 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7909	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4319	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 32.4 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.549 (Exibit 25-19)

S_R= 47.9 mph (Exhibit 25-19)

S_0= 50.3 mph (Exhibit 25-19)

S = 49.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-5 SB On
Agency or Company	TJKM	Junction	Louise Ave
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 2785 ft

V_u = 1491 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5995	0.95	Level	14	1	0.933	1.00	6765
Ramp	2423	0.95	Level	16	1	0.924	1.00	2760
UpStream	1491	0.95	Level	8	1	0.960	1.00	1635
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1032 pc/h

V_3 or V_{av34} 1953 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 1975 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7699	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4735	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 35.3 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Determination

M_S = 0.700 (Exibit 25-19)

S_R= 45.9 mph (Exhibit 25-19)

S_0= 51.5 mph (Exhibit 25-19)

S = 47.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☑ Yes ☑ On		☐ Yes ☐ On
☐ No ☐ Off		☑ No ☐ Off
L_{up} = 2000 ft		L_{down} = ft
V_u = 270 veh/h	S_{FF} = 55.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3966	0.95	Level	18	1	0.916	1.00	4559
Ramp	433	0.95	Level	25	1	0.887	1.00	514
UpStream	270	0.95	Level	24	1	0.891	1.00	319
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 743 pc/h

V_3 or V_{av34} 1407 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1422 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4071	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1936	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 14.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.285 (Exibit 25-19)

S_R= 51.3 mph (Exhibit 25-19)

S_0= 53.0 mph (Exhibit 25-19)

S = 52.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2000 ft

V_u = 645 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	10020	0.95	Level	9	1	0.955	1.00	11043
Ramp	1291	0.95	Level	23	1	0.895	1.00	1518
UpStream	645	0.95	Level	9	1	0.955	1.00	711
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1785 pc/h

V_3 or V_{av34} 3379 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3417 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	10061	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4935	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 37.6 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.800 (Exibit 25-19)

S_R= 44.6 mph (Exhibit 25-19)

S_0= 46.9 mph (Exhibit 25-19)

S = 45.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2000 ft

V_D = 433 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3802	0.95	Level	17	1	0.920	1.00	4350
Ramp	270	0.95	Level	24	1	0.891	1.00	319
UpStream								
DownStream	433	0.95	Level	18	1	0.916	1.00	498

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.178 using Equation (Exhibit 25-5)

V_{12} = 604 pc/h

V_3 or V_{av34} 1395 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 1357 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3713	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1676	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 16.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.322 (Exibit 25-19)

S_R= 50.8 mph (Exhibit 25-19)

S_0= 53.1 mph (Exhibit 25-19)

S = 52.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	2030 No Proj
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 2000 ft

V_D = 1291 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9366	0.95	Level	8	1	0.960	1.00	10273
Ramp	645	0.95	Level	9	1	0.955	1.00	711
UpStream								
DownStream	1291	0.95	Level	23	1	0.895	1.00	1518

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.129 using Equation (Exhibit 25-5)

V_{12} = 1002 pc/h

V_3 or V_{av34} 3385 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 3109 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8484	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3820	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 33.2 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.479 (Exibit 25-19)

S_R= 48.8 mph (Exhibit 25-19)

S_0= 48.3 mph (Exhibit 25-19)

S = 48.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2100 ft

V_u = 1188 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	9695	0.95	Level	12	1	0.942	1.00	10838
Ramp	538	0.95	Level	15	1	0.929	1.00	610
UpStream	1188	0.95	Level	25	1	0.887	1.00	1409
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.142 using Equation (Exhibit 25-5)

V_{12} = 1180 pc/h

V_3 or V_{av34} 3579 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3335 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8948	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3945	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 34.8 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.510 (Exibit 25-19)

S_R= 48.4 mph (Exhibit 25-19)

S_0= 47.3 mph (Exhibit 25-19)

S = 47.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	MacArthur Dr.
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2100 ft

V_u = 584 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4757	0.95	Level	10	1	0.951	1.00	5268
Ramp	272	0.95	Level	14	1	0.933	1.00	307
UpStream	584	0.95	Level	9	1	0.955	1.00	644
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.179 using Equation (Exhibit 25-5)

V_{12} = 737 pc/h

V_3 or V_{av34} 1686 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1644 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4417	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1951	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 19.4 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.336 (Exibit 25-19)

S_R= 50.6 mph (Exhibit 25-19)

S_0= 52.4 mph (Exhibit 25-19)

S = 51.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	MacArthur Dr
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2100 ft

V_D = 538 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	10345	0.95	Level	13	1	0.937	1.00	11619
Ramp	1188	0.95	Level	25	1	0.887	1.00	1409
UpStream								
DownStream	538	0.95	Level	15	1	0.929	1.00	610

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1906 pc/h

V_3 or V_{av34} 3606 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3647 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	10528	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5056	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 37.4 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.856 (Exibit 25-19)

S_R= 43.9 mph (Exhibit 25-19)

S_0= 45.9 mph (Exhibit 25-19)

S = 44.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	MacArthur Dr
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2100 ft

V_D = 272 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5078	0.95	Level	9	1	0.955	1.00	5596
Ramp	584	0.95	Level	9	1	0.955	1.00	644
UpStream								
DownStream	272	0.95	Level	14	0	0.935	1.00	306

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 889 pc/h

V_3 or V_{av34} 1682 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1701 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4897	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2345	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 16.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.285 (Exibit 25-19)

S_R= 51.3 mph (Exhibit 25-19)

S_0= 52.2 mph (Exhibit 25-19)

S = 51.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	3992	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2000 ft

V_u = 947 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3802	0.95	Level	18	1	0.916	1.00	4370
Ramp	890	0.95	Level	25	1	0.887	1.00	1056
UpStream	947	0.95	Level	24	1	0.891	1.00	1118
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 712 pc/h

V_3 or V_{av34} 1348 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1363 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4465	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2419	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 18.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.302 (Exibit 25-19)

S_R= 51.1 mph (Exhibit 25-19)

S_0= 53.1 mph (Exhibit 25-19)

S = 52.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2000 ft

V_u = 1424 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	9366	0.95	Level	9	1	0.955	1.00	10322
Ramp	1194	0.95	Level	23	1	0.895	1.00	1404
UpStream	1424	0.95	Level	9	1	0.955	1.00	1569
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1635 pc/h

V_3 or V_{av34} 3093 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3128 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	9226	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4532	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 34.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.620 (Exibit 25-19)

S_R= 46.9 mph (Exhibit 25-19)

S_0= 48.2 mph (Exhibit 25-19)

S = 47.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 2000 ft

V_D = 890 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3259	0.95	Level	17	1	0.920	1.00	3729
Ramp	947	0.95	Level	24	1	0.891	1.00	1118
UpStream								
DownStream	890	0.95	Level	18	1	0.916	1.00	1023

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 608 pc/h

V_3 or V_{av34} 1150 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1163 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4027	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2281	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 16.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.285 (Exibit 25-19)

S_R= 51.3 mph (Exhibit 25-19)

S_0= 53.7 mph (Exhibit 25-19)

S = 52.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 EB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	2030 No Proj
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off; L_{down} = 2000 ft; V_D = 1194 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	8977	0.95	Level	8	1	0.960	1.00	9846
Ramp	1424	0.95	Level	9	1	0.955	1.00	1569
UpStream								
DownStream	1194	0.95	Level	23	1	0.895	1.00	1404

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1535 pc/h

V_3 or V_{av34} 2905 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2938 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8915	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4507	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 33.3 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.600 (Exibit 25-19)

S_R= 47.2 mph (Exhibit 25-19)

S_0= 48.9 mph (Exhibit 25-19)

S = 48.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2100 ft

V_u = 1438 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	8772	0.95	Level	12	1	0.942	1.00	9806
Ramp	1115	0.95	Level	15	1	0.929	1.00	1264
UpStream	1438	0.95	Level	25	1	0.887	1.00	1706
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1527 pc/h

V_3 or V_{av34} 2889 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2922 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8570	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4186	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 32.2 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.517 (Exibit 25-19)

S_R= 48.3 mph (Exhibit 25-19)

S_0= 48.9 mph (Exhibit 25-19)

S = 48.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB Off
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 2100 ft

V_u = 1341 veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3938	0.95	Level	10	1	0.951	1.00	4361
Ramp	1141	0.95	Level	14	1	0.933	1.00	1288
UpStream	1341	0.95	Level	9	1	0.955	1.00	1478
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 711 pc/h

V_3 or V_{av34} 1345 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 1360 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4690	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2648	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 20.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.316 (Exibit 25-19)

S_R= 50.9 mph (Exhibit 25-19)

S_0= 53.1 mph (Exhibit 25-19)

S = 51.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	AM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off; L_{down} = 2100 ft; V_D = 1115 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	9695	0.95	Level	13	1	0.937	1.00	10889
Ramp	1438	0.95	Level	25	1	0.887	1.00	1706
UpStream								
DownStream	1115	0.95	Level	15	1	0.929	1.00	1264

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 1753 pc/h

V_3 or V_{av34} 3318 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3355 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	10095	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5061	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 37.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.859 (Exibit 25-19)

S_R= 43.8 mph (Exhibit 25-19)

S_0= 47.2 mph (Exhibit 25-19)

S = 45.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JL	Freeway/Dir of Travel	I-205 WB On
Agency or Company	TJKM	Junction	Paradise
Date Performed	9/25/2009	Jurisdiction	Lathrop
Analysis Time Period	PM Peak Hour	Analysis Year	2031 plus Proj

Project Description River Islands

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 55.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{down} = 2100 ft

V_D = 1141 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4757	0.95	Level	9	1	0.955	1.00	5243
Ramp	1341	0.95	Level	9	1	0.955	1.00	1478
UpStream								
DownStream	1141	0.95	Level	14	0	0.935	1.00	1285

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.209 using Equation (Exhibit 25-5)

V_{12} = 855 pc/h

V_3 or V_{av34} 1617 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1636 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5568	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3114	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 22.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.332 (Exibit 25-19)

S_R= 50.7 mph (Exhibit 25-19)

S_0= 52.4 mph (Exhibit 25-19)

S = 51.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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Appendix F – Air Quality and Climate Change Supporting Information

Appendix F-1

Criteria Pollutant and Greenhouse Gas Emissions Modeling Methodology and Assumptions

Appendix F-1
Criteria Pollutant and Greenhouse Gas Emissions Modeling Methodology and Assumptions

This appendix discusses the approach and methodology used to assess construction and operational emissions associated with implementation of Phase 2B of the River Islands Project. This analysis evaluates yearly combined construction and operational emissions because construction activities would occur concurrently with operation of the dwelling units and facilities built during previous years. Emissions analyzed include criteria pollutants and greenhouse gases (GHGs).

The key sources of data used in the preparation of this chapter are:

- *River Islands at Lathrop Project Description* (EIS Chapters 1, 2).
- Technical Assumptions Memorandum: *Air Quality and GHG Modeling Inputs*, June 28, 2010 (Appendix F-2).
- *Subsequent Draft Environmental Impact Report for the River Islands at Lathrop Project* (October 16, 2002).
- *Documentation of California's Greenhouse Gas Inventory* (July 2010).
- *California Climate Action Registry General Reporting Protocol* (January 2009).
- *California Commercial End-Use Survey* (March 2006).
- *The Climate Registry Default Emission Factors* (January 2010).
- *Traffic Impact Study for River Islands Phase 2B Development* (June 2010).
- *AP 42, Fifth Edition. Compilation of Air Pollutant Emission Factors.* (2008).

Specific reference information is provided in the text.

F-1.1 Construction

Construction of the proposed project would generate emissions of reactive organic gases (ROG), oxides of nitrogen (NO_X), carbon monoxide (CO), particulate matter (PM10 and PM2.5), and carbon dioxide (CO_2) that would result in short-term impacts on ambient air quality in the project area. Emissions would originate from mobile and stationary construction equipment exhaust, employee vehicle exhaust, dust from clearing the land, exposed soil eroded by wind, and ROG from architectural coatings and asphalt paving. Construction-related emissions vary substantially depending on the level of activity, length of the construction period, specific construction operations, types of equipment, number of personnel, wind and precipitation conditions, and soil moisture content.

F-1.1.1 Schedule and Phasing

Based on the Air Quality and GHG Modeling Inputs Memorandum[1], construction phasing for each residential district and other private development was assumed to be sequential, with site grading, utility trenching, paving, building construction, and architectural coatings occurring in sequence. The project applicant does not have a detailed construction schedule or a distribution of each phase in the construction sequence. Consequently, assumptions about the duration of each construction phase were made using professional judgment based on experience with similar development projects, and are presented in Table 2.

Levee and lake construction were assumed to begin in 2019 and continue until 2031. Soil hauling and grading activities were evenly divided between these years. Operation of each construction component was assumed to begin immediately following construction. For example, 250 dwelling units scheduled to be constructed in 2019 were assumed to be fully operational in 2020. For all project components, except for in-water and streamside construction, construction activities were assumed to occur 5 days per week from the start of to the end of each calendar year. For in-water and streamside construction, construction activities were assumed to occur 7 days per week from July 1 through September 30 (2015 through 2031).

Construction phasing assumptions are presented in Table 1. This table lists the duration of each phase in terms of the percent of the total duration for each major construction activity. All major construction assumptions are presented in Table 2.

Table 1. River Islands Project Construction Phasing Distribution

	Percent Split for each Construction Phase			
Construction Phase/Sequence	Residential, Hotels, Commercial, and School	Roads	Bridges	Parks and Golf Courses
Clearing/Grubbing	–	17	8	–
Grading/Excavation	17	17	17	50
Utility	8	17	8	–
Paving	8	50	50	17
Building Construction	58	–	17	33
Architectural Coatings	8	–	–	–
Total	**100%**	**100%**	**100%**	**100%**

Note: percentages may not sum to 100% due to rounding errors. Percentages are based on the number of months needed for each construction phase for a year-long construction period. For example, a year of residential construction would entail 2 months of grading, 1 month of utility work, 1 month of paving, 7 months of building construction, and 1 month of architectural coatings.

[1] The *Air Quality and GHG Modeling Inputs* memorandum (June 28, 2010) presents the general assumptions ICF compiled for use as model inputs in the air quality and GHG emissions modeling for River Islands at Lathrop Phase 2B. This memorandum is included as Appendix F-2 of this EIS.

Table 2. River Islands Proposed Project Construction and Operational Schedule and Assumptions

	Construction							Operation					
	Quantity Under Construction							Quantity Operational					
Year	Residential (units)	Facilities (ft^2)	Hotel (rooms)	Docks and Bridges (ft^2)	Parks and Golf Courses (acres)	Net Area Disturbed (acres)[a]	Net Yards Soil Hauled	Residential (units)	Facilities (ft^2)	Hotel (rooms)	Parks and Golf Courses (acres)	Berths/ Boats	Daily VMT[b]
2015	–	–	–	15,898	–	–	–	–	–	–	–	24	–
2016	–	–	–	15,898	–	–	–	–	–	–	–	48	–
2017	–	–	–	15,898	–	25	1,057,336	–	–	–	–	72	–
2018	–	–	–	15,898	–	25	1,057,336	–	–	–	–	96	–
2019	250	–	–	49,319	–	82	1,057,336	–	–	–	–	170	–
2020	166	46,000	–	33,421	36	163	1,062,892	250	–	–	–	221	47,827
2021	250	–	–	84,421	36	107	1,067,836	416	46,000	–	36	271	133,871
2022	250	–	–	45,821	36	221	1,058,336	666	46,000	–	72	322	142,835
2023	500	61,000	–	70,621	186	298	1,059,336	916	46,000	–	109	372	194,239
2024	300	64,000	–	33,421	–	612	1,057,336	1,416	107,000	–	295	423	343,950
2025	–	10,000	–	71,821	–	71	1,067,836	1,716	171,000	–	295	473	411,160
2026	663	–	–	33,421	–	68	1,057,336	1,716	181,000	–	295	524	413,843
2027	663	46,000	–	33,421	36	115	1,057,336	2,379	181,000	–	295	574	524,433
2028	663	200,000	–	33,421	–	115	1,057,336	3,041	227,000	–	331	625	656,898
2029	663	–	–	33,421	–	195	1,057,336	3,704	427,000	–	331	675	821,143
2030	–	–	–	–	–	593	1,057,336	4,366	427,000	–	331	675	931,566
2031	588	416,667	163	–	–	68	1,057,336	4,366	427,000	–	331	675	931,566
2032	588	441,667	163	–	187	187	–	4,954	843,667	163	331	675	1,185,156
2033	588	462,667	163	–	–	11	–	5,541	1,285,334	325	518	675	1,494,958
2034	588	416,667	163	–	–	–	–	6,129	1,748,000	488	518	675	1,760,888
2035	–	–	–	–	–	–	–	6,716	2,164,667	650	518	675	2,014,043
Total	**6,716**	**2,164,667**	**650**	**586,120**	**518**	**2,957**	**15,889,600**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Source: TJKM Transportation Consultants 2010.

ft^2 = square feet.

VMT = vehicle miles travelled.

[a] The maximum daily area disturbed is determined by CalEEMod based on equipment type and will be a percentage of the net area disturbed.

[b] Based on daily operational VMT provided by TJKM Transportation Consultants for the years 2017 and 2031.

Criteria Pollutants

The California Emissions Estimator Model (CalEEMod) (version 2011.1.1) model was used to estimate emissions associated with construction of the River Islands at Lathrop project. A rough construction schedule, construction phase information, and list of equipment (with specific horsepower) for each construction phase was available from the *Air Quality and GHG Modeling Inputs* Memorandum (Appendix F-2). Consistent with the original analysis, the URBEMIS 2007 model was used to determine the duration of construction phases and refine the final start and end dates for each construction phase, which varies by phase type and land use type[2].

Due to the overlapping construction schedules of certain phases and CalEEMod's inability to model phases with overlapping dates, only the daily construction emissions for each phase were modeled. These unique daily emissions were then multiplied by the total number of construction days associated with that phase to derive the total associated emissions. However, model inputs for hauling trips, paving acreage, and architectural coating square footage reflected activity for an entire phase and was assumed incorrectly by CalEEMod to occur in a single day. Thus, hauling, paving, and architectural coating activities were not multiplied by the total number of days, but were instead considered as the total emissions from the entire phase. Also, default load factors within CalEEMod have been superseded by the default load factors within the revised Carl Moyer Program Guidelines, which were approved by ARB on April 28, 2011. Accordingly, equipment load factors are based on the latest Carl Moyer Program Guidelines. The number of equipment for each phase was estimated using CalEEMod default equipment numbers, which vary by construction phase type, equipment type, and project acreage.

Estimates of the acres disturbed and volumes of soil required for levee construction were obtained from the Grading Plan, provided by River Islands at Lathrop. A mass balance of soil was assumed for construction of lakes and levees: all soil required for levee construction and augmentation was assumed to be provided from the excavated soil associated with construction of the lake and canal system. No soil imports or exports were included in the analysis. The analysis assumed a total volume of 15,889,600 cubic yards of soil was moved during 2017–20231. A maximum distance of 5 miles for soil hauling was assumed. Table 2 summarizes soil hauling assumptions associated with project construction.

GHG Emissions

GHG emissions from construction will be primarily from fuel use by construction equipment, worker commutes, and on-road heavy duty trucks (such as material delivery trucks and soil hauling trucks). The CalEEMod (version 2011.1.1)was used to calculate CO_2 emissions associated with the describe construction.

CalEEMod accounts for CO_2 emissions resulting from fuel use by construction equipment and worker commutes. CalEEMod does not quantify nitrous oxide (N_2O) emissions, although this pollutant is known to be emitted from construction equipment. N_2O emissions associated with construction activity from off-road equipment were determined by scaling the construction methane (CH_4) emissions by the ratio between CH_4 and N_2O diesel emission factors from The Climate Registry (The Climate Registry 2010). Construction equipment using diesel fuel emits 0.58

[2] For a given land use type (e.g. school, single-family home), URBEMIS 2007 phases include an excavation/grading phase, a roadway paving phase, a building construction phase, and an architectural coating phase

gram CH_4 per gallon and 0.26 gram N_2O per gallon (The Climate Registry 2010). The ratio of CH_4 to N_2O per gallon of diesel fuel is 2.23. Calculated CH_4 emissions for each year divided multiplied by this ratio to estimate N_2O emissions from construction equipment operation. These emissions were then converted to carbon dioxide equivalents (CO_2e) using the global warming potential (GWP) of each gas.

Construction worker commutes also produce GHGs from the consumption of fuel in on-road vehicles. Since on-road vehicles used for commuting will not all be using diesel fuel, the previous methodology for calculating non-CO_2 GHGs from construction equipment is inappropriate. The U.S. Environmental Protection Agency (EPA) recommends assuming that CH_4, N_2O, and hydrofluorocarbon (HFC) emissions account for 5% of on-road GHG emissions, accounting for their GWPs (U.S. Environmental Protection Agency 2011). The annual CO_2 emissions from construction worker commutes were divided by 0.95 to account for emissions of CH_4, N_2O, and HFCs.

F-1.2 Operation

The construction schedule provided by the project applicant indicates that construction activities will be completed by 2034. The full buildout year of 2035 was used in this analysis to account for potential changes and delays in the construction schedule. Emission factors for all sources except for transportation are assumed to remain static in the future, which is a conservative assumption. For example, emission factors associated with energy usage are likely to decrease as a function of time due to promulgated environmental regulations. As such, 2033 emission are likely greater than emissions associated with subsequent years.

Table 2 lists the yearly development types, number of units, and area allocated to each proposed facility or residence on the River Islands project site.

Full buildout (2035) criteria pollutant and GHG operational emissions include:

- Transportation emissions.
- Area source emissions resulting from hearths, landscaping activities, use of consumer products, and architectural coatings.
- Emissions resulting from commercial and residential building electricity and natural gas consumption.
- Emissions resulting from municipal sources, including solid waste generation and disposal, water supply and distribution, wastewater treatment, and public lighting.
- Emissions associated with golf course maintenance, lake and levee maintenance, and boating activities.

Emissions from land-use change and life-cycle emissions were not included in the project's inventory due to the high range of uncertainty associated with these emissions sources.

F-1.2.1 Criteria Pollutants

Criteria pollutant emissions were estimated for each of the sources listed above. Specific methods and assumptions for each source are described in detail below.

Transportation

Operational emissions from transportation were calculated using CalEEMod (version 2011.1.1) model for each year of operation from 2020 to 2035. Trip generation information used in the analysis is based on trip generation data provided by the project traffic engineers, TJKM Transportation Consultants (TJKM) (TJKM Transportation Consultants 2010). Default values provided by CalEEMod were used for trip percentages. The TJKM traffic data indicated that net total daily vehicle miles travelled (VMT) is 2,015,005 at full project buildout in 2035. To calculate annual VMT for all years of project development (i.e., 2020–2035), project trip rates and trip lengths associated with each land use type were applied to the number of facilities anticipated to be fully operational each year (Table 2). The default CalEEMod fleet mix for the San Joaquin Valley Air Pollution Control District (SJVAPCD) was used to model transportation emissions.

Area Source

CalEEMod was used to calculate operational criteria pollutant emissions for full buildout (2035) conditions. At the proposed project site, area sources include emissions from landscaping activities, consumer products (i.e., automotive products, household cleaners, personal care products), and periodic paint emissions from facility upkeep. Emissions associated with natural gas combustion were accounted for under the Residential/Commercial Natural Gas Use category.

Area source emissions for each building type will occur once the building is fully operational. These emissions will begin the first year the building is fully operational and continue each subsequent year. For residential buildings, construction is spaced out over many years; consequently, the number of operational dwelling units increases during each subsequent year and is based on the schedule provided in Table 2. For nonresidential buildings, it was assumed that each building/facility would be operational following its final year of construction (i.e., there are no interim year emissions for nonresidential buildings/facilities and emissions commence upon full buildout of the buildings/facilities) (see Table 2).

Except for natural gas combustion, emissions from area sources were modeled using CalEEMod default values. Natural gas combustion emissions were modeled using specific usage rates provided by the project applicant and emission factors obtained from the EPA and (U.S. Environmental Protection Agency 2012a). Default CalEEMod emissions rates were used for landscaping activities, consumer products, and paint emissions.

Residential/Commercial Natural Gas Use

The proposed project will use natural gas for heating and other operational activities. Natural gas consumption data for the project area was provided by Navigant Consulting (Navigant Consulting 2002a).[3] Natural gas emissions were modeled separately from CalEEMod using EPA emissions factors.

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[3] Electricity and natural gas consumption data provided by Navigant Consulting are based on estimates of future energy use for each facility in the River Islands project. Actual residential and commercial energy use in 2035 will depend largely on the specific size and design of the buildings, habits regarding heating and AC, and plug-in energy usage. Actual commercial energy use in 2035 will also depend on individual owner's habits and specific energy usage. Consequently, there is uncertainty associated with the project's 2035 energy consumption and the resulting GHG emissions presented in this analysis.

Criteria pollutant emissions from natural gas combustion were calculated independent of the CalEEMod model to allow for more accurate and appropriate natural gas emission factors for residential and commercial natural gas combustion using EPA emission factors (U.S. Environmental Protection Agency 2011).

These emission factors and conversions were used (all emission factors were assumed to remain constant over time):

- One standard cubic foot of natural gas equals 1,029 British thermal units (btu) (California Climate Action Registry 2009).
- Criteria pollutant emission factors for residential natural gas are from EPA's AP-42, and are (in pounds per million cubic feet [lbs/MCF]): 7.6 (PM10 and PM2.5), 94 (NO_X), 40 (CO), and 7.26 (ROG) (U.S. Environmental Protection Agency 1995).

Key assumptions for residential energy include:

- According to the Natural Gas Study prepared for River Islands by Navigant Consulting, the natural gas usage for single-family, multi-family townhouses and multi-family apartments is 0.04, 0.03, and 0.025 million cubic feet (MCF) per hour respectively. At 7 hours per day for 365 days per year, this translates to 102, 89, and 77 MCF per unit per year respectively (Navigant Consulting 2002a).
- Natural gas is the only fuel used in residential development operations; there will be no fuel oil, kerosene, liquid propane gas (LPG), or wood combusted.

Key assumptions for commercial energy include:

- According to the California Energy Commission's (CEC's) California Commercial End-Use Survey (CEUS), the natural gas consumption for each building type within the Pacific Gas and Electric Company (PG&E) service area is presented below in Table 3 (California Energy Commission 2006a).

Table 3. River Islands Proposed Natural Gas Consumption Assumptions

Building Type	Natural Gas (therms/ft^2)	Natural Gas (kBtu/ft^2)
All Commercial	0.29	28.67
School	0.22	21.75
Lodging	0.38	38.14
Miscellaneous	0.24	24.11
Source: California Energy Commission 2006a.		

- Natural gas is the only fuel used in commercial development operations; there will be no fuel oil, kerosene, LPG, or wood combusted.

Solid Waste Haul Trucks

Waste hauling emissions were also estimated by using annual waste disposal tonnage, city of Lathrop landfill locations, and EMFAC2011 emission factors for solid waste collection vehicles (for more detail on assumptions regarding waste generation rates and landfills, see the Solid Waste section under GHG Emissions below) (California Air Resources Board 2012).

Key assumptions include:

- The round trip distance from Lathrop to each landfill was estimated using Google maps.
- The average refuse truck waste payload is 12 tons (U.S. Environmental Protection Agency 1997:62; Cavette 2010).

Boating Activities

Emissions associated with boating activities include direct emissions from boats consuming diesel and gasoline fuel and natural gas consumption at the boat storage facility. Each source is described in greater detail below.

Boat Operation

Emissions associated with boat operations were quantified using the California Air Resources Board's (CARB's) OFFROAD2011 model and boating activity from the Boating Impact Analysis (BIA) (California Air Resources Board 2007; EDAW 2009). Criteria pollutants from the boating operations were modeled for each year that boats would operate.

Key assumptions include:

- Boating activity and fleet mix are based on the BIA (EDAW 2009), which included the following specific assumptions:
  - Berths are 100% occupied when their construction is complete.
  - 20% of the boats are in-use on a peak-day.
  - The average boat trip is 5.7 hours.
- Boat emission factors from the OFFROAD model are based on five-year increments beginning in 2015 (the first year of boating operations); the most conservative emission factor for the given five-year increment was used for each year of boating activity.
- Because OFFROAD outputs total particulate matter, PM10 is 100% of the total particulate matter emissions for both diesel and gasoline fuel, while PM2.5 is 92.0% and 99.8% of the PM emissions for diesel- and gasoline-powered boats, respectively (South Coast Air Quality Management District 2006).

Boat Storage Facility

Estimated natural gas consumption for the boat storage facility was combined with criteria pollutant emission factors to determine annual emissions. The boat storage facility will come online in 2018. All emission factors and conversions are outlined in the *Residential/Commercial Natural Gas Use* section.

- Key assumptions include:
- The size of the boat storage facility is 12,600 square feet (ft^2), which is based on 126 ft^2 per boat for 100 boats.
- Natural gas consumption for the boat storage facility is presented below in Table 4 (California Energy Commission 2006a).

Table 4. River Islands Proposed Natural Gas Consumption Assumptions

Building Type	Natural Gas (therms/ft^2)	Natural Gas (kBtu/ft^2)
All warehouses	4.77	4.64
Source: California Energy Commission 2006a.		

Lake and Levee Maintenance

Criteria pollutant emissions associated with operation of the lakes and levees system includes operation of the pumping system required for flood control and lake level maintenance activities associated with periodic dredging of Lathrop Landing, Paradise Cut Canal and the Lake. The OFFROAD model was used to estimate emissions from the dredging equipment specified in the technical memorandum. Dredging was assumed to begin in 2028 and occur every 10 years. Pumping was assumed to begin in 2028 and occur every year. Criteria pollutant emissions from electrical pumps were estimated using electricity usage and emission factors specific to water pumps (University of Georgia 2009). These emission factors represent current conditions and thus a worst-case scenario. Criteria pollutant in future years will likely be less due to advances in pumping motor efficiency.

Emissions from maintenance workers commuting to the site were calculated using emission factors from the CalEEMod model.

Key assumptions include:

- The dredging work season is 20 days per year.
- The intake pumping work season is 25 days per year; outtake pumping work season is 50 days per year (operating every year).
- Activities would occur 8 hours per day.
- Dredging would require 10 workers per day and pumping would require 5 workers per day during maintenance activities.
- Round trip commute distance is 60 miles (30 miles each way).
- Emissions calculated for one dredging event were amortized over the lifetime of the project to estimate annual emissions (emissions were multiplied by 40 [estimated lifetime of the project in years] and divided by 5 [estimated number of dredging events over 40 years from 2028–2068]).

F-1.2.2 Amortized Construction Emissions

Total construction emissions from 2015 to 2034 were amortized over the 40-year lifetime of the project and added to the 2032 full-buildout annual operational emissions. Construction assumptions are discussed in the previous section.

F-1.2.3 GHGs

GHG emissions were estimated for each of the sources listed above. Specific methods and assumptions for each source are described in detail below.

Transportation

Trip generation information and VMT data used in the analysis was provided by the project traffic engineers, TJKM, and is described in the *Criteria Pollutants* section above. Transportation GHG emissions were estimated based on the VMT and daily trip generation under interim and full project buildout conditions. Operational emissions of GHG were modeled using the CalEEMod model. Emission calculations for mobile source emissions were based on the daily trip generation data provided by the project traffic engineers, TJKM (TJKM Transportation Consultants 2010). CalEEMod utilizes CARB's EMFAC2011 emission rate program to produce emissions estimates for transportation (California Air Resources Board 2012). CalEEMod is widely recommended and used by many California air districts for calculating criteria pollutant emissions from a variety of projects.

GHG emissions from transportation represent a conservative estimate of project-related emissions because the emission factors produced by EMFAC2011 do not include the reductions in mobile-source GHG emissions that would result from implementation of Assembly Bill (AB) 1493 or other regulations. The traffic data provided by the project traffic engineer, TJKM, indicates that net total daily VMT is 2,015,005 at full project buildout in 2035. This data accounts for reductions in overall project trips and associated VMT due to internal passby trip reductions.

Area Source

CalEEMod was used to calculate GHG emissions for 2035 fully operational project buildout conditions. Area sources emitting GHG emissions include landscaping activities, and natural gas combustion (described below). As described above, emissions from area sources were modeled using CalEEMod default values (except for natural gas combustion).

Golf Course Maintenance

GHG emissions due to golf course operational activities of the Lake Harbor District and Woodlands Golf Course were estimated using the CalEEMod model and equipment lists as described above. Key assumptions for modeling GHG emissions from this source are the same as those listed in the *Criteria Pollutants* section above.

Residential/Commercial Electricity and Natural Gas Use

The proposed project will use natural gas for heating and other operational activities. Natural gas and electricity consumption data for the project area was provided by Navigant Consulting (Navigant Consulting 2002a).[4] As described above, natural gas emissions were modeled separately from CalEEMod using CalEEMod and EPA emissions factors and specific natural gas data provided in the River Islands EIR.

New residential, commercial, and additional buildings in the project area will result in indirect GHG emissions associated with increased electricity demand. The project would receive electricity generated by PG&E, which has a lower CO_2 emissions factor than the statewide average. Projected

[4] Electricity and natural gas consumption data provided by Navigant Consulting are based on estimates of future energy use for each facility in the River Islands project. Actual residential and commercial energy use in 2035 will depend largely on the specific size and design of the buildings, habits regarding heating and AC, and plug-in energy usage. Actual commercial energy use in 2035 will also depend on individual owner's habits and specific energy usage. Consequently, there is uncertainty associated with the project's 2035 energy consumption and the resulting GHG emissions presented in this analysis.

electricity consumption for all commercial and residential facilities was provided by Navigant Consulting (Navigant Consulting 2002b). CH_4 and N_2O emissions per megawatt hour (MWh) of electricity generated were assumed to remain constant through 2035 because it is unclear how CO_2 reduction efforts would affect CH_4 and N_2O emission rates for electricity consumption. It is likely that CH_4 and N_2O emissions will decline as CO_2 emissions per MWh decline; however, because the direct relationship is unclear, a worst-case scenario in which efficiencies of these emissions relative to CO_2 do not improve was assumed.

Electricity transmission lines release SF_6, which is a used as an insulator in transmission lines, over time. Emissions of SF_6 were quantified by multiplying the projected electricity consumption in the River Islands project area in 2032 by the statewide SF_6 emission factor per kilowatt hour (kWh) from the ARB for 2008 (California Air Resources Board 2010a). Though PG&E is taking action to reduce SF_6 emissions from transmission lines, the emission factor was assumed to remain constant over time to represent a worst-case scenario (Pacific Gas and Electric Company 2009).

GHG emissions from natural gas combustion were calculated independent of the CalEEMod model to allow for more accurate and appropriate natural gas emission factors for residential and commercial natural gas combustion using California Climate Action Registry and The Climate Registry reporting protocol guidance (California Climate Action Registry 2009; The Climate Registry 2010). Natural gas consumption rates are presented in the *Criteria Pollutants* section above.

Actual emissions from electricity consumption and natural gas use from the River Islands project in 2035 will likely be less than those estimated in this analysis due to the reductions in GHG emissions resulting from implementation of AB 32 as well as improvements in building standards due to Title 24, California's Energy Efficiency Standards for Residential and Nonresidential Buildings. Implementation of AB 32 and Title 24 would likely increase energy efficiency and may reduce emissions factors for electricity and natural gas provided by PG&E. It is unknown what effect AB 32 and Title 24 will have on energy efficiency and emissions factors by 2035, and thus they were left out of the analysis. Consequently, this analysis provides a worst-case scenario of associated GHG emissions.

Emission factors and conversions (all emission factors were assumed to remain constant over time):

- The CO_2 emission factor for electricity is 444.64 lbs/MWh, which represents electricity deliveries for PG&E for 2010 (Climate Registry Information System 2012).
- The CH_4 and N_2O emission factors for electricity are 28.94 and 6.17 lbs/GWh respectively, which represents electricity generation for 2005 for the CAMX region (U.S. Environmental Protection Agency 2012a).
- The CO_2, CH_4, and N_2O emission factors for natural gas are 53.02 kg/MMBtu, 0.0370 grams/cubic meter, and 0.0350 grams/cubic meter, respectively (The Climate Registry 2012).

Key assumptions for residential energy include:

- According to the Electric Study prepared for River Islands by Navigant Consulting, the electricity consumption for low, medium, and high density residential units is 14,454 kWh, 11,318 kWh, and 8,199 kWh per unit per year respectively (Navigant Consulting 2002b).
- According to the Natural Gas Study prepared for River Islands by Navigant Consulting, the natural gas usage for single family, multi-family townhouses, and multi-family apartments is

0.04, 0.03, and 0.025 MCF per hour respectively. At 7 hours per day for 365 days per year, this translates to 102, 89, and 77 MCF per unit per year respectively (Navigant Consulting 2002a).

- In addition to wood combusted in residential hearths/fireplaces, natural gas is the only fuel used in residential development operations; there will be no fuel oil, kerosene, LPG, or other fuel combusted.

Key assumptions for commercial energy include:

- According to the Electric Study prepared for River Islands by Navigant Consulting, the electricity consumption for each building type is presented below in Table 5 (Navigant Consulting 2002a).

Table 5. River Islands Proposed Electricity Consumption Assumptions

Building Type	Watts/ft^2	Load Factor	kWh/ft^2
Elementary School—Small	8.7	19.7%	14.9
Lodging—Hotel	3.8	29.0%	9.7
Office—Medium	8.2	31.3%	22.4
Service Station	12.4	60.6%	65.8
Source: Navigant Consulting 2002b.			

- According to the CEC CEUS, the electricity consumption for each building type within the PG&E service area is presented below in Table 6 (natural gas consumption data is presented in the *Criteria Pollutants* [Table 3 and Table 4] section above) (California Energy Commission 2006a).

Table 6. River Islands Proposed Electricity Consumption Assumptions

Building Type	Electricity (kWh/ft^2)
All Commercial	12.95
School	6.82
Lodging	9.78
Miscellaneous	9.14
Source: Navigant Consulting 2002b.	

- The per-capita electricity use for streetlights in San Joaquin County is 49.5 kWh; this number was multiplied by the projected annual population of River Islands to determine street lighting electricity (California Energy Commission 2008).

Solid Waste

The disposal of food waste, yard trimmings, paper and wood in landfills results in the production of CH_4 and CO_2 when anaerobic bacteria degrades the material (U.S. Environmental Protection Agency 2006b). CO_2 is produced during the natural degradation process; however, emissions of CH_4 are the primary result of landfilling waste. Waste generated by River Islands residential and commercial operations will be transported offsite to the same landfills used by the City of Lathrop.

Waste generation estimates (per residential unit or square foot per day) for each building type obtained from the California Department of Resources Recycling and Recovery (CalRecycle) were multiplied by the number of units or square feet in operation during each year of development to determine daily waste generation estimates (California Department of Resources Recycling and Recovery 2010). These daily waste generation estimates were then multiplied 365 days per year and separated by general waste type using the city of Lathrop waste profile and diversion estimates to determine annual waste disposal. Annual waste disposal was multiplied by the methane emission factors from the International Council for Local Environmental Initiatives (ICLEI) Clean Air and Climate Protection Software (Version 1.1) to determine annual emissions of landfill methane. Waste hauler emissions were estimated by using annual waste disposal tonnage, city of Lathrop landfill locations, and EMFAC emission factors for the solid waste collection vehicle category.

Key assumptions include:

- Estimated solid waste generation rates from CalRecycle for each building type are presented below in Table 7.

Table 7. River Islands Solid Waste Generation Rate Assumptions by Building Type

Building Type	Generation Rate	Units
Single Family	12.23	lb/household/day
Multifamily	8.60	lb/household/day
Commercial	0.059	lb/sq ft/day
Education/schools	0.007	lb/sq ft/day
Public/Institution	0.007	lb/sq ft/day
Golf Course greenwaste	41.644	lb/mowable acre/day
Golf Course other waste	0.500	lb/golfer/day
Hotel	4.000	lb/room/day

Source: California Department of Resources Recycling and Recovery 2005; 2009a; 2009b; 2009c; 2009d.

- Methane emission factors for each waste type from ICLEI's CACP methane commitment method are presented below in Table 8. These emission factors represent the landfill methane emissions that will eventually occur as the result of waste that is produced and landfilled in the current year and attributes that methane to the emissions inventory for that year (International Council for Local Environmental Initiatives 2005).

Table 8. ICLIE Waste Emission Factors

Emission Factor	Units	Waste Type
1.940	metric tons CO_2e/ton	paper
1.098	metric tons CO_2e/ton	food
0.622	metric tons CO_2e/ton	plant
0.549	metric tons CO_2e/ton	wood
0	metric tons CO_2e/ton	other

Source: International Council for Local Environmental Initiatives 2005.

- Golf course generation of normal waste is based on a per-golfer basis; according to the Department of Agricultural and Applied Economics, the average number of rounds played per day (golfers per day) for 18 hole non-regulation, municipal regulation, daily-fee regulation, and private regulation golf courses is 135.6 (Department of Agricultural and Applied Economics 2002).

- The average golf course has 100 acres of maintained turfgrass (mowable acres) (Golf Course Superintendents Association of America 2009).
- Waste generated has the same profile and diversion rate as the city of Lathrop (California Department of Resources Recycling and Recovery 2010).
- Waste will be disposed in the same landfills as the City of Lathrop (California Department of Resources Recycling and Recovery 2007).
- 99.9 percent of waste disposed by the city of Lathrop will be landfilled in landfills without methane recovery (California Department of Resources Recycling and Recovery 2007; U.S. Environmental Protection Agency 2010b).
- The average methane recovery efficiency of landfills is 75% (U.S. Environmental Protection Agency 1999); consequently, the weighted methane recovery efficiency is 0.06 percent.
- The round trip distance from Lathrop to each landfill was estimated using Google Maps (Altamont–24 miles; Fink Road–38 miles; Foothill–34 miles; Forward Inc.–13 miles; North County–13 miles; Sacramento County (Kiefer)–58 miles; Vasco Road–29 miles).
- The average refuse truck waste payload is 12 tons (SOURCE).

Water Demand

Considerable quantities of energy are required to treat and deliver water across California. The energy required to treat and deliver water to the River Islands project is considered an indirect project emission and is included in the River Islands GHG inventory. The expected water demand for the River Islands project area in 2035 is 3,652 acre-feet per year.

Water demand estimates (per residential unit or square foot per year) for each building type were multiplied by the number of units or square feet in operation during each year of development to determine annual water demand estimates. Annual water supply estimates were multiplied by the electricity intensity factors for water conveyance, treatment, and distribution in the area.

Key assumptions include:

- Estimated water demand from the *Water Supply Study for the City of Lathrop* for each building type are presented below in Table 9 (City of Lathrop 2009).

Table 9. City of Lathrop Estimated Water Demand

Building Type	Water Demand
Residential	AFY/Unit
Low Density Residential	0.382
Medium Density Residential	0.423
High Density Residential	0.244
Commercial	AFY/Unit
Town Center	1.681
Employment Center	1.681
Retail /Commercial	1.680
Community	AFY/Unit
Golf Course Club House	1.680
Golf Course Irrigation	1.900
Schools	3.360
Parks	1.900

Source: City of Lathrop 2009; Golf Course Superintendents Association of America 2009.
AFY = acre-feet per year.

- The average golf course has 100 acres of maintained turfgrass (two thirds of the total average golf course area), 80% of which are irrigated (Golf Course Superintendents Association of America 2009). Consequently, each golf course will require 152 acre-feet of water per year to irrigate.
- The amount of irrigated acres for parks is the same as golf courses (two thirds of the total park area is maintained turfgrass; 80% of maintained turfgrass will be irrigated).
- According to the River Islands SEIR Public Utilities section, water will be provided by the South San Joaquin Irrigation District (SSJID) South County Surface Water Supply project, which pumps water via pipeline from the Woodward reservoir (City of Lathrop 2002). For the purposes of this analysis, electricity intensity factor for water supply and conveyance is for the Tracy Pump Station, which is the nearest pump station location with a reported electricity intensity factor (the amount of electricity required to transport a specific amount of water). The factor is 238 kWh per acre-foot (California Energy Commission 2005).
- Average electricity intensity factors for Northern California were used for water treatment and distribution. These factors are 111 kWh and 1,272 kWh per million gallons (California Energy Commission 2006b).
- Golf course and park irrigation water is subject to the same energy intensity factors as all other water demand, including water conveyance, treatment, and distribution.

Wastewater Treatment

Emissions associated with wastewater treatment include indirect emissions from electricity consumption at wastewater treatment plants and direct fugitive emissions from the wastewater treatment process. Each source is described in greater detail below.

Electricity Use

Wastewater flow estimates (per residential unit or square foot per year) for each building type were multiplied by the number of units or square feet in operation during each year of development to determine annual wastewater flow estimates. Annual wastewater flow estimates were multiplied by the electricity intensity factors for wastewater treatment in Northern California.

Key assumptions include:

- Estimated average dry weather wastewater flows from the River Islands SEIR Appendix K for each building type are presented below in Table 10 (City of Lathrop 2002).

Table 10. River Islands Average Dry Weather Wastewater Generation Rate Assumptions by Building Type

Building Type	Wastewater Generation Rate
Residential	GPD/Unit
Low Density Residential	288
Medium Density Residential	234
High Density Residential	189
Commercial	GPD/AC
Town Center	1,200
Employment Center	1,200
Retail /Commercial	1,200
Community	GPD/AC
Golf Course Club House	1,200
Golf Course Irrigation	0
Schools	1,000
Parks	0

Source: City of Lathrop 2002.
GPD = gallons per day.

- Average electricity intensity factors for Northern California were used for wastewater treatment. This factor is 1,911 kWh per million gallons (California Energy Commission 2006b).
- Water used to irrigate the golf courses and parks will not go through a wastewater treatment process (irrigation water is recycled / tertiary-treated effluent), and therefore no energy consumption for wastewater treatment is associated with this water.

Fugitive Emissions

Wastewater can produce CH_4 and N_2O when treated anaerobically due to the anaerobic breakdown of organic matter. CO_2 emissions from wastewater are considered biogenic in origin and therefore are not included in estimates of anthropogenic emissions (Intergovernmental Panel on Climate Change 2006). Wastewater will break down under anaerobic conditions during the wastewater treatment process, which will produce CH_4 as a byproduct. Tertiary treatment will remove some nitrogen from the reclaimed water and dried solids produced for reuse on the project site.

Fugitive emissions of CH_4 and N_2O from wastewater treatment processes were calculated based on per capita emission rates from the ARB (statewide emissions). Processes include: centralized anaerobic treatment (CH_4), anaerobic digesters (CH_4), and effluent emissions (N_2O). The project applicant provided an estimated population of 19,514 residents and 1,920 non-resident employees for the project area in 2032.

Key assumptions include:

- RI wastewater treatment plants involve centralized anaerobic treatment, anaerobic digesters, and effluent.
- Emissions/person for River Islands is the same as statewide averages for 2008, as indicated in Table 11:

Table 11. Per Capita CH4 and N2O Fugitive Wastewater Treatment Emission Rates

Treatment	g CH_4/person	g N_2O/person
Centralized Anaerobic	474.3	0.0
Anaerobic Digesters	25.6	0.0
Effluent Emissions	0.0	63.3
Total	**500.0**	**63.3**
Source: California Air Resources Board 2010b; 2010c; 2010d.		

Boating Activities

Emissions associated with boating activities include direct emissions from boats consuming diesel and gasoline fuel, as well as natural gas and electricity consumption at the boat storage facility. Each source is described in greater detail below.

Boat Operation

Emissions associated with boat operations were quantified using the CARB's OFFROAD2011 model and boating activity from the Boating Impact Analysis (California Air Resources Board 2007; EDAW 2009) as described in the *Criteria Pollutants* section above. GHG emissions from the boating operations were modeled for each year that boats would operate.

Boat Storage Facility

Estimated electricity and natural gas consumption for the boat storage facility was combined with GHG emission factors to determine annual emissions. All emission factors and conversions are outlined in the *Residential/Commercial Electricity and Natural Gas Use* section above. Natural gas consumption rates are presented in the *Criteria Pollutants* section above.

Key assumptions include:

- According to the Electric Study prepared for River Islands by Navigant Consulting, the electricity consumption for the boat storage facility is presented below in Table 12 (Navigant Consulting 2002b).

Table 12. River Islands Boast Storage Electricity Consumption Assumptions

Building Type	Watts/ft^2	Load Factor	kWh/ft^2
Conditioned Warehouse	3.5	37.3%	11.44
Source: Navigant Consulting 2002b.			

Lake and Levee Maintenance

GHG emissions associated with operation of the lakes and levees system were estimated as described above in the *Criteria Pollutants* section using the OFFROAD model. GHG emissions from electrical pumps were estimated using electricity usage and emission factors specific to water pumps and CO_2 emission factors from PG&E listed above (University of Georgia 2009; California Climate Action Registry 2010). These emission factors represent current conditions and thus a worst case scenario. GHG Emissions in future years will likely be less due to advances in pumping motor efficiency and PG&E and other energy provider's efforts to comply with the State Renewable Portfolio Standard (RPS)[5].

F-1.3 Assumptions for Alternatives

For each project alternative, the same assumptions and methods for estimating construction and operational emissions were used. These assumptions and methods are described above. However, each alternative differs slightly in terms of construction activities and operations. The following assumptions presented in Table 13 were used to estimate construction and operational emissions for each project alternative. These are based on the air quality and GHG modeling inputs technical memorandum and the project description (Chapter 2 of this EIS).

Table 13. Comparison of River Islands Construction and Operational Assumptions

Alternative	Construction Assumptions	Operational Assumptions
Alternative 1a	No construction of docks along Paradise Cut; 30% reduction in dock construction	No docks along Paradise Cut; 30% reduction in boating activities.
Alternative 1b	• 225 additional acres graded (10% increase) • 10% increase in fugitive PM10 emissions • 10% increase in residential road and utility construction emissions • No construction of docks along Paradise Cut	• 225 additional residential development area—potential higher energy consumption due to more low density dwelling units • No docks (and associated boating activities) along Paradise Cut
Alternative 2	• 5 additional bridges: double bridge construction emissions • Altered lake construction (amount unknown) • More extensive grading (amount unknown)	• 150 acres less residential development area—potential lower energy consumption due to more high density dwelling units • Less boating activities (amount unknown) • More water and sewer pumping (amount unknown)
Alternative 3	Combination of Alternatives 1 and 2	Combination of Alternatives 1 and 2
No Action	1 additional bridge: increase bridge construction emissions	none

[5] California's RPS requires increased energy production from renewable sources until 33% is reached, no later than 2020. Renewable energy sources have lower associated GHG emission factors than non-renewable sources, so compliance with the RPS will reduce emissions associated with electricity consumption in California.

Based on the assumptions above, operational and construction emissions for each alternative will differ slightly. The following table (Table 14) shows percent increases or decreases (compared to the proposed project) in emissions estimates for each alternative.

Table 14. Differences in River Islands Construction and Operational Assumptions

Alternative	% Change in Total Construction Emissions	% Change in Total Operational Emissions
Alternative 1a	up to 1% less	up to 3% less
Alternative 1b	up to 10% more	>0% (amount unknown)
Alternative 2	up to 2% more	Unknown
Alternative 3	up to 10% more	>0% (amount unknown)
No Action	up to 0.5% more	Unknown

F-1.4 CO Hotspot Modeling

An evaluation to determine whether CO hot spots would occur at roadway intersections in the vicinity of the proposed project was conducted with CO dispersion modeling. The effects of operation-related CO emissions were evaluated using the CALINE4 dispersion model developed by the California Department of Transportation (Caltrans) (Benson 1989). CALINE4 treats each segment of a roadway as a separate emission source producing a plume of pollutants that disperses downwind. Pollutant concentrations at any specific location are calculated using the total contribution from overlapping pollution plumes originating from the sequence of roadway segments. CO modeling was conducted for two conditions: design-year baseline and design-year with-project conditions.

F-1.4.1 Modeling Procedures

All assumptions regarding EMFAC2007 and CALINE4 are presented in Table 15 and are detailed in the following sections.

Table 15. CO Modeling Assumptions

EMFAC2007	
2017 CO emissions factors (g/mile)	4.4
2031 CO emissions factors (g/mile)	2.0
CALINE4	
aerodynamic roughness coefficient	100 cm
altitude	0 meters
temperature	42°F
humidity	30%
wind speed	0.5 mph
atmospheric stability	7 (class G)
wind direction	worst case
wind direction standard deviation	5°
mixing height	1,000 meters
background CO concentration	
1 hr	3.5 ppm
8 hr	2.1 ppm
roadway link length	1,000 meters
link type	at-grade
link height	0 meters
Sources: University of California, Davis 1997; U.S. Environmental Protection Agency 2010c.	

F-1.4.2 Roadway and Traffic Conditions

Traffic volumes and operating conditions used in the modeling were obtained from the traffic analysis prepared for the proposed project by TJKM (TJKM Transportation Consultants 2010). CO emissions were modeled for existing year (2012), interim year with and without project conditions (2020) and future year (2034) with and without project conditions. Free-flow traffic speeds were adjusted to reflect congested speeds using methodology from the Transportation Carbon Monoxide Protocol (University of California, Davis 1997). A speed of 1 mile per hour (mph) was used to represent a worst-case scenario. An aerodynamic roughness coefficient of 100 centimeters was used for all modeling. This value is recommended by the CO Protocol for suburban areas. CO modeling was conducted at the Golden Valley Parkway/River Islands Parkway, I-5 Southbound Ramps/Louise Avenue, Paradise Road/Arbor Avenue, D-27 Street/Golden Valley Parkway, Broad Street/Golden Valley Parkway, S. River Islands Parkway/Golden Valley Parkway intersections as they represent intersections with the worst level of service (LOS) and highest traffic volumes of all intersections analyzed in the project area (TJKM Transportation Consultants 2010).

F-1.4.3 Vehicle Emission Rates

Vehicle emission rates were determined using the California Air Resources Board's EMFAC2011 emission rate program. EMFAC2011 modeling procedures followed the guidelines recommended by Caltrans (California Department of Transportation 2003). The program assumed average Kern County regional traffic data operating during the winter months. A mean minimum January temperature of 42° Fahrenheit and humidity of 30% were also assumed. Emissions factors were calculated for 5 mph for the years 2017 and 2030.

F-1.4.4 Roadway Link Geometry

Each intersection is represented in CALINE4 as a collection of roadway links. Each link is a straight segment of road with a fixed traffic volume and emissions factor. The roadway link geometry was determined using methodology recommended in the *Transportation Project-Level Carbon Monoxide Protocol* (University of California, Davis 1997). To accurately model project area intersection traffic volume and emissions factors, each intersection was separated into four links: eastbound, westbound, northbound and southbound directions of travel. Each roadway link was assumed to be at-grade (level with the ground) with a link height of zero. Each link coincides with the centerline of the traveled way (i.e., traffic lanes not including shoulders) for the given intersection. The intersection center is located at the origin and each roadway link extends 1,000 meters away from the intersection in the appropriate direction to allow accurate dispersion and mixing.

F-1.4.5 Receptor Locations

CO concentrations were estimated at four receptor locations located at each of the intersections analyzed, for a total of 20 receptors. The receptors were placed 3 meters from the traveled way of each intersection at the boundary of the mixing zone to represent a worst-case scenario. Receptor heights were set at 5.9 feet.

F-1.4.6 Meteorological Conditions

Meteorological inputs to the CALINE4 model were determined using methodology recommended in Air Quality Technical Analysis Notes (California Department of Transportation 1988). The meteorological conditions used in the modeling represent a calm winter period. Worst-case wind angles were modeled to determine a worst-case concentration for each receptor. The meteorological inputs include: 0.5 meter per second wind speed; ground-level temperature inversion (atmospheric stability class G); wind direction standard deviation equal to 5°; ambient temperature of 42 degrees Fahrenheit (°F) (5.6 degrees centigrade [°C]); altitude above sea level of 0 feet; and a mixing height of 1,000 meters.

F-1.4.7 Background Concentrations and 8-Hour Values

To account for sources of CO not included in the modeling, a background concentration of 3.13 parts per million (ppm) was added to the modeled cumulative 1-hour values, while a background concentration of 2.02 ppm was added to the modeled cumulative 8-hour values. Background concentration data for 1- and 8-hour values were obtained from the EPA's AirData website (U.S. Environmental Protection Agency 2012). Eight-hour modeled values were calculated from the 1-hour values using the default persistence factor of 0.6 (represents rural and suburban locations). Background concentrations for future 2020 and 2034 years were assumed to be the same as those for the current year. Actual 1- and 8-hour background concentrations in future years would likely be lower than those used in the CO modeling analysis because the trend in CO emissions and concentrations is decreasing because of continuing improvements in engine technology and the retirement of older, higher-emitting vehicles.

F-1.5 Dispersion Modeling (HRA screening)

A Health Risk Assessment (HRA) screening analysis was conducted to determine health risks associated with diesel particulate matter (DPM) emissions from construction equipment. This analysis was prepared generally following the California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment's guidance document titled "The Air Toxics Hot Spots Program Guidance Manual for Preparation of Human Health Risk Assessment" (OEHHA Guidance) (Office of Environmental Health Hazard Assessment 2008). Health risks were calculated following additional guidance including CARB's Recommended Interim Risk Management Policy for Inhalation Based Cancer Risk (California Air Resources Board 2003) and the SJVAPCD's Guidance for Air Dispersion Modeling (San Joaquin Valley Air Pollution Control District 2007).

The SCREEN3 model was used to conduct the HRA screening analysis. The screening analysis was conducted for sensitive receptors located in the vicinity of the project area, ranging in distance from 50 to 10,000 feet from construction activities. These sensitive receptor locations were selected for the screening analysis to represent the locations where sensitive receptors (residents and a school) could be exposed to the maximum levels of DPM from construction equipment and truck hauling activities.

Assumptions regarding SCREEN3 modeling are presented in Table 16. This information, along with worst-case meteorology, was entered into SCREEN3 to determine the DPM health risks associated with unmitigated off-road construction emissions.

Table 16. SCREEN3 Modeling Assumptions for the Average and Worst-Case Scenarios

Category	Average Scenario	Worst-Case Scenario
DPM Emissions (tons)	9.25	1.19
Area of Construction Activity	2,954	300
DPM Emission Rate ($g/s\text{-}m^2$)	6.59×10^{-9}	1.06×10^{-7}
Duration of DPM emission rate	20 years (4,536 work days)	1 years (261 work days)
Duration of exposure	20 years (4,536 work days)	20 years (4,536 work days)
Source Type	Area	Area
Source Height (m)	0	0
Receptor Height (m)	0	0
Number of Receptors	10	10
Urban or Rural	Rural	Rural
Mixing Height	Default	Default
Anemometer Height	Default	Default

The exact location and duration of construction activity is unknown because construction of the project is in the early stages of development. Location and duration of emissions are important for analyzing health risks because they determine downwind concentrations of DPM. To provide a range of possible health risks from construction activity anticipated to occur on the project site, the analysis incorporated two scenarios.

1. The first or "average" scenario uses an averaged DPM emission rate calculated from emissions that would occur during the entire 20 years construction period (2015 through 2034)over the

entire nearly 3,000 acre construction site. This scenario accounts for the unknown location of construction activity, and represents average health risks from construction. However, it is unlikely that construction activity and associated emissions will occur uniformly over the entire site. Concentrated emissions have the potential to produce increased health risks for some receptors, especially if those emissions occur in close proximity to receptors.

2. The second or "worst-case" scenario assumes that the maximum annual DPM emissions (which occur in 2020) would occur consistent over the lifetime of construction (2015 through 2034) over the area of construction (300 acres) for that maximum annual year. This scenario represents a conservative estimate of emissions and health risks because it assumes that the DPM emission rate is much higher than under the average scenario, due to the use of the maximum annual DPM emissions year spread out over a smaller area.

Additional health risks may occur due to emissions of on-road diesel trucks idling near sensitive receptors. Emissions from idling trucks were calculated separately from off-road emissions following guidance from the SJVAPCD (San Joaquin Valley Air Pollution Control District 2007) using the SCREEN3 model. The following assumptions presented in Table 17 were used for both the "average" and "worst-case" scenarios:

Table 17. SCREEN3 Modeling Assumptions

Category	Value
Stack height (m)	3.84
Stack diameter (m)	0.1
Temperature (kelvin)	366
Ambient temp (kelvin)	293
Exit velocity (m/s)	0.001
Square Meters (m^2)	2.57
SCREEN3 Emission Rate (g/s)	7.139E-04
Total Number of Trucks	110,461
Days	4,536
Seconds idling/truck (5 minutes)	300
Net Exposure Duration (days)	384

Source: San Joaquin Valley Air Pollution Control District 2007.

Once Off-road and on-road health risks were separately calculated, they were then added together to determine the maximum overall health risk from construction activity at each receptor location. Although truck idling emissions may not always occur adjacent to off-road emissions, this was assumed to occur to present a conservative estimate of health risks.

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Appendix F-2

Air Quality and GHG Modeling Inputs

ICF INTERNATIONAL

Memorandum

Date:	June 28, 2010
To:	Susan Dell'Osso, River Islands at Lathrop
Cc:	Patti Johnson, U.S. Army Corps of Engineers Ramon Batista, River Islands at Lathrop Kristin Hageseth, ICF Steve Centerwall, ICF
From:	ICF Air Quality Team
Subject:	**Air Quality and GHG Modeling Inputs**

This memorandum presents the assumptions compiled for use as model inputs in the air quality (criteria pollutant) and greenhouse gas emissions modeling for the River Islands at Lathrop Phase 2B EIS. The following sections address assumptions for key aspects of the project, with the proposed action described first, followed by the alternatives. Assumptions regarding equipment (types, numbers, horsepower) used in construction and maintenance are given in the Appendix table at the end of the memo.

Proposed Action

Construction Phasing and Schedule

Based on current understanding, the following illustrates the assumed timeline for project construction. Elements approved under earlier phases of the project are italicized.

- 2012
  - *Construct first 1,500–2,300 units in Phase 1 and Phase 2A areas (completion in 4–6 years).*
- 2012 - 2016
  - Build all docks in San Joaquin River.
- 2014
  - During summer season (July–September), construct Paradise Cut improvements.

- 2014-2016
  - Construct interim 200-year levee along Paradise Cut and Old River; levee crown will be 65-75 feet wide at this time, and will be widened progressively as development proceeds. Fill for levee construction will be from onsite borrow sources.
- 2016
  - Begin construction of interior lake system.
  - Begin construction of Lathrop Landing back bay.
  - Begin construction of docks along Old River; a total of 51 docks (255 berths) to be constructed by 2026.
  - Construct backbone roads for Town Center, including *Water Street, Commercial Street, North River Islands Parkway (from Lakeside District to Bradshaw's Crossing)*, and South River Islands Parkway (to Golden Valley Parkway).
  - *Continue residential development in Phases 1 and 2A (not analyzed in EIS).*
  - Begin development in Phase 2B.
  - Residential development construction continues at approximately 500 units per year. Assume 250 units per year in Phase 2B and 250 units per year outside Phase 2B until Phase 1 and 2A are built out. After Phases 1 and 2A reach buildout, assume 500 units per year all absorbed by Phase 2B.
  - *Begin commercial development for Phase 1. Phase 1 (not analyzed in EIS) consists of approximately 62 acres of Town Center land use (approximately 2.7 million square feet, to be completed by 2020) and 164 acres of Employment Center land use (approximately 7 million square feet, to be completed by 2025).*
  - Employment Center construction continues at a linear rate of 250,000 square feet per year. Construction begins in east (Phase 1 and progresses westward; Phase 1 commercial built out before Phase 2 commercial begins).
- 2017
  - Finish construction of Lathrop Landing back bay; breach San Joaquin river levee.
  - Construct *eastern portion of Canal Street (before Lake Harbor Crossing)*, South River Islands Parkway (to Water Street), *D-27 Street, Broad Street, and D-20 Street*.
  - *Construct Phase 1 fire station (10,000 square feet).*
  - Begin construction of parks. Parks assumed to be constructed in the mid-years of construction of associated residential district.
  - Begin construction of first elementary school in Lakeside District (46,000 square feet).

- 2018
  - Construct first two-lane bridge section over San Joaquin River, initiating Golden Valley Parkway Bridge). (This two-lane bridge will be completed in 2018.)
  - Construct boat storage facility in Town Center District adjacent to Lathrop Landing.
- 2019
  - Construct bridges to and from Lake Harbor District on South River Islands Parkway.
- 2020
  - Construct Old River Road.
  - Construct Paradise Road Bridge and Golden Valley Parkway Bridge over Paradise Cut.
  - Begin construction of second elementary school in West Village District (46,000 square feet).
  - Construct 18-hole golf course in Lakeside District.
- 2021
  - *Finish construction of Canal Street and remaining adjacent interior roads.*
  - Begin construction of middle school in West Village District or Woodlands District (64,000 square feet).
- 2022
  - Construct Phase 2B fire station (10,000 square feet).
  - Construct second two-lane bridge section over San Joaquin River, completing Golden Valley Parkway Bridge).
- 2024
  - Begin construction of third elementary school (46,000 square feet) in West Village District or Woodlands District.
- 2025
  - Begin construction of high school in Woodlands District (200,000 square feet).
- 2026
  - Begin commercial development for Phase 2; Phase 2B portion of Employment Center District constructed between 2026 and 2031, consisting of approximately 141 acres (approximately 2 million square feet).
- 2027
  - Construct Woodlands Drive and any improvements to Paradise Road.
  - Begin hotel construction in Employment Center District (325 rooms).

- 2028
  - Complete Phase 2B levee widening (expansion of Paradise Cut and Old River levees).
  - Complete interior lake system (lakes constructed as fill for levees is required).
- 2029
  - Construct second Phase 2B fire station (10,000 square feet), located in Woodlands District, if needed.
  - Construct 18-hole golf course in Woodlands District.
- 2030
  - Construct fourth elementary school (46,000 square feet) in Woodlands District.
- 2031
  - Finish construction of hotel in Employment Center (650 rooms total).
  - Project reaches full buildout.

Flood Protection, Lake Construction, and Maintenance

- In-water and streamside construction would be restricted to the dry season outside fish protection window (translates to July 1‐September 30 during any given year).
- Unless specified otherwise, all equipment used in construction is assumed to operate continually for 8 hours a day, 90 days every year. (This is probably a conservative/worst-case assumption.)
- Pumps are assumed to be electric. Information on electric equipment such as intake pumps, including the projected equipment energy use (Kwh/hr), assumptions on motor rating (hp or Kw) and duty cycle (hr/yr) will be based on the Hydrologic Systems (HSI) memorandum sent to ICF Jones & Stokes on April 23, 2009 (See Table 1). Analysis will assume 50 days/year operation for outtake pumps, and 25 days/year for intake pumps, assuming 24/7 operation during operating periods.
- Minimal dredging for maintenance will occur as needed (assumed as once every 15 years for lake system, once every 10 years for Lathrop Landing back bay, and spot dredging once every 10 years in Paradise Cut, at maximum). Assume 8 hours per day for 2‐4 weeks as duration of dredging during each year it occurs.
- Staging areas for material removed to create the internal lake system (or other) that will also be used for levee construction/widening will be at a maximum 5 miles from the project site.
- All material used for levee construction/widening will be locally sourced (within 5 miles of the project site)

Private Development

- Phase 2B would construct 6,716 single- and multi-family units.
- Construction for private development would occur year-round.
- Residential construction would proceed by district, from southeast corner to northwest corner of Stewart Tract, as follows.
  - East Village.
  - Employment Center (throughout).
  - Lakeside.
  - Lake Harbor.
  - Old River Road.
  - West Village.
  - Woodlands.
- Residential units would be fully occupied immediately after construction and will continue to be occupied in subsequent years.
- For each area developed, five generic phases of construction that will occur sequentially: site grading (including levee widening), utility trenching (includes dry and wet trenching), paving, building construction, and architectural coatings. River Islands does not have information on duration of each construction phase for each district in Phase 2B.
- Spoils haulage would use trucks with a capacity of 20 cubic yards.
- Main access roads (e.g., River Islands Parkway) would be constructed during the first year of construction.
- Backbone roads adjacent to each developing area would be built during the first year of that district's construction. Subdivision roads would be constructed as development proceeds.
- The Phase 1/Phase 2B split for the Lakeside and Old River Road Districts is as follows.
  - 300 units in the Lakeside District under Phase 2B (1,284 units in Phase 1).
  - 793 units in Old River Road District under Phase 2B (373 units in Phase 1).
- Construction of schools would begin in 2012. Two K-5 schools and one 6-8 grade school are assumed to be located in Phase 1 (i.e., outside the scope of EIS analysis). Four K-5 schools and one 6-8 grade school are assumed to be located in Phase 2B. The high school would be located in Phase 2B. The assumed locations are as follows.
  - One or two K-5 schools in the Woodlands District.
  - Two K-5 schools in the West Village District.
  - One K-5 school in Phase 2B portion of Lakeside District.

- One 6-8 grade school in West Village or Woodlands District.
- One high school in the Woodlands District.

- The construction of retail space would occur during the mid-years of development of West Village, which is entirely within Phase 2B. The office/retail center in West Village would be approximately 17 acres.
- Parks would be constructed in the mid-years of the development of their respective residential districts.
- Land uses in the Employment Center would include retail uses (185,000 square feet at buildout), credit card and financial service centers, back office and processing centers, regional administration hubs, telecommunications centers, regional sales and marketing centers, development and prototype assembly facilities, and research facilities In addition, approximately 650 hotel rooms would be constructed.

Recreation/Amenities/Municipal Services Development

- 24 docks (120 berths) would be built along the San Joaquin River in 2014–2016.
- 14 docks (70 berths) would be installed in Lathrop Landing no later than 2016, prior to breaching of the existing project levee.
- 51 docks (255 berths) would be built along the Old River in 2016–2026.
- Development of other boating infrastructure will occur in conjunction with adjacent residential development.
- Marina and dock facilities will be fully occupied and operational immediately following construction, and will continue to be occupied in subsequent years.
- Lake maintenance will begin as soon as they are constructed. (This is a conservative assumption; lake temperature will be monitored, and the first two lakes in Phase 1 area have required no maintenance in 3 years.)
- One or two fire stations would be constructed in the Phase 2B area, depending on occupancy and demand. Construction is assumed to occur based on planned progress to buildout. No police station is currently planned for construction within River Islands.
- Golf courses (one per district) would be constructed in conjunction with the Lakeside and Woodlands Districts.
- Approximately 17,000 permanent jobs would be generated by River Islands at buildout with approximately 5,500 of those total jobs in Phase 2B. It is difficult to predict what percentage of workers would reside at River Islands, and the percentage would likely change over time as the project builds out. The total jobs assumed represent 1.52 jobs per household. So, theoretically 100% of River Islands' working residents could work at River Islands. According to River Islands, it would be safe to assume that 50% of the resident population would work and reside onsite, and most of the remaining balance would commute from very close-in areas.

- Approximately 7,000 temporary jobs would be generated by construction of River Islands Phase 2B.

The off-site electricity, natural gas, and water supply infrastructure required for both phases is entitled in the Phase 1 approval process. The Phase 2B air quality and climate change analysis will not include these components.

Alternatives to Proposed Phase 2B

Action Alternatives

The overall construction process and schedule for Alternatives 1 through 3 would be similar to that identified for proposed Phase 2B. The principal differences would be as follows (additional detail is given in the most current working draft of EIS Chapter 2):

- **Alternative 1a**
  - Levee along Paradise Cut would be internal setback levee; location, yardage, and timing assumed to be same as proposed Phase 2B levee.
  - No breaching of existing Paradise Cut levee; remove associated yardages and tailpipe emissions from assumptions.
  - No alterations to Paradise Cut floodway or Paradise Weir; remove associated yardages and tailpipe emissions from assumptions.
  - No habitat restoration or creation in Paradise Cut; remove associated yardages and tailpipe emissions from assumptions.
- **Alternative 1b**
  - Levee construction along Paradise Cut would be limited to landside reconstruction and expansion of existing federal project levee. Timing would be similar to the proposed Phase 2B construction. Yardage would likely be reduced, but specific quantities are not available at this time.
  - No breach of existing Paradise Cut levee would occur; remove associated yardages and tailpipe emissions from assumptions.
  - No alterations to Paradise Cut floodway or Paradise Weir; remove associated yardages and tailpipe emissions from assumptions.
  - No habitat restoration or creation in Paradise Cut; remove associated yardages and tailpipe emissions from assumptions.
  - 200 additional acres available for residential development (~10% increase by comparison with proposed Phase 2B); number of units would remain the same but density would decrease.

  - Decreased residential density would correlate to a 10% increase in road and utility construction.

- **Alternative 2**
  - No fill or construction affecting the central drainage ditch or pond would occur, and both water bodies would be protected by 100-foot-wide buffers. Overall earthwork yardages could be slightly reduced by comparison with proposed Phase 2B, but specifics are not available at this time.
  - Avoiding fill of the central drainage ditch would require construction of as many as 5 additional internal bridges to provide access between different parts of the RID Area. Bridges are assumed to be clearspan structures to avoid affecting the ditch during footing construction.
  - Avoiding the ditch and buffer would reduce the available development footprint by about 150 acres, increasing the density of commercial development in the Employment Center and residential development in the Lake Harbor District, East Village District, West Village District, and Woodlands District.
  - Avoiding the pond and buffer would reduce the available development footprint by another 7.5 acres in the West Village District.
  - Additional pump stations would be needed to pump water and sewer service across the new internal bridges. Specifics are not available at this time.
- **Alternative 3**
  - Paradise Cut alterations and fill of ditch and pond would all be avoided.
  - Changes in project components and schedule combine those identified for Alternatives 1 and 2.
  - The most conservative (worst-case) assumptions would be selected from Alternative 1a and 1b assumptions.
- **Alternative 4**
  - Onsite portions of Phase 2B would proceed as described for proposed Phase 2B.
  - Extensive additional earthwork would be needed to implement the expanded flood protection portion of this alternative. Specifics are not available at this time. Analysis will be qualitative.

No Action Alternative

The No Action Alternative would include buildout of all portions of River Islands at Lathrop, including Phase 1, Phase 2A, and Phase 2B, but without review and permitting under Section 404 of the Clean Water Act, review and permitting under 33 USC Section 408, and review and permitting under Section 10 of the Rivers and Harbors Act. Assumptions for Phase 1 and 2A construction are presented in the complete River Islands construction timeline above and summarized here.

- 2012
  - Construct first 1,500–2,300 units in Phase 1 and Phase 2A areas
  - Residential construction continues at a linear rate; completion assumed in 4-6 years.
  - Under the No Action Alternative, Lakeside District consists of 1,284 units and Old River Road District consists of 373 units.
- 2016
  - Construct backbone roads for Town Center, including Water Street, Commercial Street, and North River Islands Parkway from Lakeside District to Bradshaw's Crossing.
  - Continue residential development in Phases 1 and 2A.
  - Begin commercial development for Phase 1, consisting of approximately 62 acres of Town Center land use (about 2.7 million square feet, to be completed by 2020) and 164 acres of Employment Center land use (about 7 million square feet, to be completed by 2025).
  - Employment Center construction continues at a linear rate of 250,000 square feet per year. Construction begins in east and progresses westward.
- 2017
  - Construct eastern portion of Canal Street (before Lake Harbor Crossing), D-27 Street, Broad Street, and D-20 Street.
  - Construct Phase 1 fire station (10,000 square feet).

Air Quality and Climate Change Effects from Traffic/Transportation

Per SJCOG's recent confirmation, 2025 land use assumptions are an appropriate proxy for 2031 buildout conditions. The pace of growth in the project region has slowed due to the recent economic downturn. This condition enables EIS analysis to rely in part on modeling performed for the City's 2005 SEIR and addenda. Additional traffic information needed for EIS analysis for proposed Phase 2B and alternatives is summarized in the attached scope of work prepared at your request to support further modeling by TJKM.

Appendix: Construction and Maintenance Equipment Assumptions, Proposed Phase 2B

Table 1. Draft Equipment List for the Construction of River Islands at Lathrop Phase 2B

Project Component	Equipment Type	Horsepower*
Levee Construction and Breaching, Lake Construction	Excavator	168
	Dozers	310, 357
	Scrapers	462, 500, 313
	Graders	259, 174
	Front End Loader (Rubber Tired)	164
	Compactor	354
	Water Truck (on-road)	400, 189
	Heavy Duty Dump Trucks (on-road)	Emissions from EMFAC
	Cars/Pickups/SUVs (on-road)	Emissions from EMFAC
	Water Pull	462, 500, 313
	Crane	399
Lake Water Level and Flood Water Level Maintenance	Intake Pump No. 9	Motors 1, 2–30 Motor 3–75
	Intake Pump No. 10	Motor 1, 2–25
	Intake Pump No. 12	Motor 1–15 Motor 2–20
	Pump 12A	25
	Intake Pump No. 14	20
	Intake Pump No. 3	10
	Main Drain Pumps	Motor 1–50 Motor 2–25 Motor 3–35
	Intake Pump 13A	50
	Intake Pump 13B	30
	Intake Pump 1	30
	Intake Drain 13C	60
Dredging	Dredge (propulsion HP)	–
	Dredge Generator	200
	Dredge Pump	1650, 3000
	Service Barge	300, 50
	Small Work Boat	50

Project Component	Equipment Type	Horsepower*
Residential and Commercial Development—Clearing/Grading	Dozer	185–410
	Grader	174–259
	Tractor/Loader/Backhoe	100–317
	Water Truck	189–490
	Scraper	313
	Skid Steer Loader	44
	Haul Trucks	450
	Crushing/Processing Equipment	142–339
	Scraper	313
	Water Pull	462, 500, 313
	Crane	399
	Cars/Pickups/SUVs (on-road)	Emissions from EMFAC
Residential and Commercial Development—Asphalt Paving	Bottom Dump Trucks	Emissions from EMFAC
	Pavers	100–275
	Paving Equipment	104
	Roller	95
Residential and Commercial Development—Building Construction	Fork Lifts	145–500
	Delivery Trucks	Emissions from EMFAC
	Aerial Lift	60
	Generator	49–135
	Tractor/Loader/Backhoe	100–317
	Crane	399
	Welders	45
Roads/Bridges/Weir—Grubbing/Land Clearing	Scraper	313
	Dozer	185–410
	Signal Boards	20
	Water Truck	189–490
Roads/Bridges/Weir—Grading, Excavation	Crane	399
	Excavator	168–247
	Grader	174–259
	Dozer	185–410
	Skip Steer Loader	44–84
	Scraper	313
	Signal Boards	20
	Haul Trucks	Emissions from EMFAC
	Compactor	354
	Water Truck	400,189

Project Component	Equipment Type	Horsepower*
Roads/Bridges/Weir—Drainage/Utilities/Subgrade	Grader	174–259
	Plate Compactor	8
	Scraper	313
	Trencher	63
	Signal Board	20
Roads/Bridges/Weir—Paving	Pavers	100–275
	Paving Equipment	104
	Roller	95
	Signal Board	20
	Concrete/Mortar Mixer	10
	Concrete Truck	Emissions from EMFAC
Utility Construction	Excavator	168–247
	Trencher	63
	Crawler Tractor	147
	Tractor/Loader/Backhoe	100–317
	Dozer	185–410
	Skid Steer Loader	44–84
	Water Truck	189–490
	Compactor	354
Dock/Berth/Fishing Pier—Dry Installation	Pile driver (truck-mounted)	500
	Cranes (truck-mounted)	399
	Bore/Drill Rigs (barge-mounted)	291
	Rubber Tired Loaders	164
	Graders	174
	Water Trucks	189
	Heavy Duty Trucks (on-road)	Emissions from EMFAC
	Cars/Pickups/SUVs (on-road)	Emissions from EMFAC
Dock/Berth/Fishing Pier—Wet Installation	Pile Driver (barge-mounted)	500
	Cranes (barge-mounted)	399
	Bore/Drill Rigs (barge-mounted)	291
	Rubber Tired Loaders	164
	Graders	174
	Water Trucks	189
	Heavy Duty Trucks (on-road)	Emissions from EMFAC
	Cars/Pickups/SUVs (on-road)	Emissions from EMFAC
Boat Storage Facility Construction	Graders	174
	Rubber Tired Loaders	164
	Cranes	399
	Excavators	168

Project Component	Equipment Type	Horsepower*
Boat Storage Facility Construction Cont'd	Concrete Mixer Truck (on-road)	Emissions from EMFAC
	Compressor	106
	Generator Sets	549
	Rubber Tired Loaders	164
	Tractors/Loaders/Backhoe	108
	Trencher	63
	Skid Steer Loaders	44
	Hydro Seeder	25
	Delivery Trucks (light-/medium-duty, on-road)	Emissions from EMFAC
	Water Trucks	189
	Heavy Duty Flatbed Trucks (on-road)	Emissions from EMFAC
	Heavy Duty Dump Trucks (on-road)	Emissions from EMFAC
	Cars/Pickups/SUVs (on-road)	Emissions from EMFAC
Golf Course—Fine Site Grading	Scraper	313
	Tractor/Loader/Backhoe	108
	Excavator	168
	Rubber Tired Dozer	174
	Water Truck	189
	Cars/Pickups/SUVs (on-road)	Emissions from EMFAC
	Compactor	354
Golf Course—Paving	Paving Equipment	104
	Rollers	95
	Pavers	100
Golf Course—Building Construction	Forklift	145
	Tractor/Loader/Backhoe	108
	Crane	399
	Generator	49
	Welder	45

Appendix F-3

CalEEMod Outputs

River Islands Operation - Proposed Project 2020

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
Apartments Mid Rise	250	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural **Wind Speed (m/s)** 2.7 **Utility Company** Pacific Gas & Electric Company

Climate Zone 2 **Precipitation Freq (Days)** 45

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - Operations only

Vehicle Trips - Fire station assumptions from URBEMIS input.

Woodstoves - No woodstoves per SJVAPCD regulation

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.30	0.02	1.88	0.00		0.00	0.03		0.00	0.03	0.00	327.97	327.97	0.01	0.01	330.01
Energy	0.02	0.15	0.07	0.00		0.00	0.01		0.00	0.01	0.00	445.06	445.06	0.02	0.01	447.82
Mobile	1.81	8.41	15.06	0.04	3.27	0.27	3.54	0.06	0.25	0.32	0.00	3,359.87	3,359.87	0.10	0.00	3,362.07
Waste						0.00	0.00		0.00	0.00	23.34	0.00	23.34	1.38	0.00	52.32
Water						0.00	0.00		0.00	0.00	0.00	36.28	36.28	0.50	0.01	50.77
Total	**3.13**	**8.58**	**17.01**	**0.04**	**3.27**	**0.27**	**3.58**	**0.06**	**0.25**	**0.36**	**23.34**	**4,169.18**	**4,192.52**	**2.01**	**0.03**	**4,242.99**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.30	0.02	1.88	0.00		0.00	0.03		0.00	0.03	0.00	327.96	327.96	0.01	0.01	330.00
Energy	0.02	0.15	0.07	0.00		0.00	0.01		0.00	0.01	0.00	445.06	445.06	0.02	0.01	447.82
Mobile	1.81	8.41	15.06	0.04	3.27	0.27	3.54	0.06	0.25	0.32	0.00	3,359.87	3,359.87	0.10	0.00	3,362.07
Waste						0.00	0.00		0.00	0.00	23.34	0.00	23.34	1.38	0.00	52.32
Water						0.00	0.00		0.00	0.00	0.00	36.28	36.28	0.50	0.01	50.77
Total	**3.13**	**8.58**	**17.01**	**0.04**	**3.27**	**0.27**	**3.58**	**0.06**	**0.25**	**0.36**	**23.34**	**4,169.17**	**4,192.51**	**2.01**	**0.03**	**4,242.98**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Mitigated	1.81	8.41	15.06	0.04	3.27	0.27	3.54	0.06	0.25	0.32	0.00	3,359.87	3,359.87	0.10	0.00	3,362.07
Unmitigated	1.81	8.41	15.06	0.04	3.27	0.27	3.54	0.06	0.25	0.32	0.00	3,359.87	3,359.87	0.10	0.00	3,362.07
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	1,647.50	1,790.00	1517.50	6,292,272	6,292,272
Total	1,647.50	1,790.00	1,517.50	6,292,272	6,292,272

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	266.37	266.37	0.01	0.00	268.04
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	266.37	266.37	0.01	0.00	268.04
NaturalGas Mitigated	0.02	0.15	0.07	0.00		0.00	0.01		0.00	0.01	0.00	178.69	178.69	0.00	0.00	179.78
NaturalGas Unmitigated	0.02	0.15	0.07	0.00		0.00	0.01		0.00	0.01	0.00	178.69	178.69	0.00	0.00	179.78
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

<u>Unmitigated</u>

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Mid Rise	3.34853e+006	0.02	0.15	0.07	0.00		0.00	0.01		0.00	0.01	0.00	178.69	178.69	0.00	0.00	179.78
Total		**0.02**	**0.15**	**0.07**	**0.00**		**0.00**	**0.01**		**0.00**	**0.01**	**0.00**	**178.69**	**178.69**	**0.00**	**0.00**	**179.78**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Mid Rise	3.34853e+006	0.02	0.15	0.07	0.00		0.00	0.01		0.00	0.01	0.00	178.69	178.69	0.00	0.00	179.78
Total		**0.02**	**0.15**	**0.07**	**0.00**		**0.00**	**0.01**		**0.00**	**0.01**	**0.00**	**178.69**	**178.69**	**0.00**	**0.00**	**179.78**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Mid Rise	915640					266.37	0.01	0.00	268.04
Total						**266.37**	**0.01**	**0.00**	**268.04**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Mid Rise	915640					266.37	0.01	0.00	268.04
Total						**266.37**	**0.01**	**0.00**	**268.04**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.30	0.02	1.88	0.00		0.00	0.03		0.00	0.03	0.00	327.96	327.96	0.01	0.01	330.00
Unmitigated	1.30	0.02	1.88	0.00		0.00	0.03		0.00	0.03	0.00	327.97	327.97	0.01	0.01	330.01
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.23					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	0.98					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.03	0.00	0.00	0.00		0.00	0.02		0.00	0.02	0.00	324.91	324.91	0.01	0.01	326.88
Landscaping	0.06	0.02	1.88	0.00		0.00	0.01		0.00	0.01	0.00	3.07	3.07	0.00	0.00	3.13
Total	**1.30**	**0.02**	**1.88**	**0.00**		**0.00**	**0.03**		**0.00**	**0.03**	**0.00**	**327.98**	**327.98**	**0.01**	**0.01**	**330.01**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.23					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	0.98					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.03	0.00	0.00	0.00		0.00	0.02		0.00	0.02	0.00	324.91	324.91	0.01	0.01	326.88
Landscaping	0.06	0.02	1.88	0.00		0.00	0.01		0.00	0.01	0.00	3.06	3.06	0.00	0.00	3.12
Total	**1.30**	**0.02**	**1.88**	**0.00**		**0.00**	**0.03**		**0.00**	**0.03**	**0.00**	**327.97**	**327.97**	**0.01**	**0.01**	**330.00**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					36.28	0.50	0.01	50.77
Unmitigated					36.28	0.50	0.01	50.77
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Mid Rise	16.2885 / 10.2688					36.28	0.50	0.01	50.77
Total						**36.28**	**0.50**	**0.01**	**50.77**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Mid Rise	16.2885 / 10.2688					36.28	0.50	0.01	50.77
Total						**36.28**	**0.50**	**0.01**	**50.77**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					23.34	1.38	0.00	52.32
Unmitigated					23.34	1.38	0.00	52.32
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Mid Rise	115					23.34	1.38	0.00	52.32
Total						**23.34**	**1.38**	**0.00**	**52.32**

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Mid Rise	115					23.34	1.38	0.00	52.32
Total						**23.34**	**1.38**	**0.00**	**52.32**

9.0 Vegetation

River Islands Operation - Proposed Project 2021

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
Elementary School	46	1000sqft
City Park	36.17	Acre
Apartments Low Rise	18	Dwelling Unit
Apartments Mid Rise	380	Dwelling Unit
Single Family Housing	18	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Wind Speed (m/s) 2.7

Utility Company Pacific Gas & Electric Company

Climate Zone 2

Precipitation Freq (Days) 45

1.3 User Entered Comments

Project Characteristics -

Land Use -

Construction Phase - Operations only

Vehicle Trips - Fire station assumptions from URBEMIS input.

Woodstoves - No Woodstove per SJVAPCD regulation

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.35	2.80	1.67	0.00	0.01	0.14	0.15	0.00	0.14	0.14	0.00	245.57	245.57	0.03	0.00	246.17
Total	**0.35**	**2.80**	**1.67**	**0.00**	**0.01**	**0.14**	**0.15**	**0.00**	**0.14**	**0.14**	**0.00**	**245.57**	**245.57**	**0.03**	**0.00**	**246.17**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.35	2.80	1.67	0.00	0.00	0.14	0.14	0.00	0.14	0.14	0.00	245.57	245.57	0.03	0.00	246.17
Total	**0.35**	**2.80**	**1.67**	**0.00**	**0.00**	**0.14**	**0.14**	**0.00**	**0.14**	**0.14**	**0.00**	**245.57**	**245.57**	**0.03**	**0.00**	**246.17**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	2.79	0.09	6.27	0.01		0.00	0.57		0.00	0.57	68.61	545.75	614.35	0.34	0.01	624.48
Energy	0.03	0.30	0.14	0.00		0.00	0.02		0.00	0.02	0.00	891.39	891.39	0.03	0.02	896.91
Mobile	3.43	15.81	28.36	0.07	6.41	0.51	6.92	0.12	0.47	0.58	0.00	6,647.87	6,647.87	0.19	0.00	6,651.88
Waste						0.00	0.00		0.00	0.00	54.29	0.00	54.29	3.21	0.00	121.66
Water						0.00	0.00		0.00	0.00	0.00	109.85	109.85	0.87	0.02	135.44
Total	**6.25**	**16.20**	**34.77**	**0.08**	**6.41**	**0.51**	**7.51**	**0.12**	**0.47**	**1.17**	**122.90**	**8,194.86**	**8,317.75**	**4.64**	**0.05**	**8,430.37**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	2.45	0.04	3.12	0.00		0.00	0.05		0.00	0.05	0.00	545.73	545.73	0.02	0.01	549.12
Energy	0.03	0.30	0.14	0.00		0.00	0.02		0.00	0.02	0.00	891.39	891.39	0.03	0.02	896.91
Mobile	3.43	15.81	28.36	0.07	6.41	0.51	6.92	0.12	0.47	0.58	0.00	6,647.87	6,647.87	0.19	0.00	6,651.88
Waste						0.00	0.00		0.00	0.00	54.29	0.00	54.29	3.21	0.00	121.66
Water						0.00	0.00		0.00	0.00	0.00	109.85	109.85	0.87	0.02	135.44
Total	**5.91**	**16.15**	**31.62**	**0.07**	**6.41**	**0.51**	**6.99**	**0.12**	**0.47**	**0.65**	**54.29**	**8,194.84**	**8,249.13**	**4.32**	**0.05**	**8,355.01**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.34	2.79	1.61	0.00		0.14	0.14		0.14	0.14	0.00	238.41	238.41	0.03	0.00	239.00
Total	**0.34**	**2.79**	**1.61**	**0.00**		**0.14**	**0.14**		**0.14**	**0.14**	**0.00**	**238.41**	**238.41**	**0.03**	**0.00**	**239.00**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.01	0.01	0.07	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	7.16	7.16	0.00	0.00	7.17
Total	**0.01**	**0.01**	**0.07**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**7.16**	**7.16**	**0.00**	**0.00**	**7.17**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.34	2.79	1.61	0.00		0.14	0.14		0.14	0.14	0.00	238.41	238.41	0.03	0.00	239.00
Total	**0.34**	**2.79**	**1.61**	**0.00**		**0.14**	**0.14**		**0.14**	**0.14**	**0.00**	**238.41**	**238.41**	**0.03**	**0.00**	**239.00**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.01	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.16	7.16	0.00	0.00	7.17
Total	**0.01**	**0.01**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.16**	**7.16**	**0.00**	**0.00**	**7.17**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.43	15.81	28.36	0.07	6.41	0.51	6.92	0.12	0.47	0.58	0.00	6,647.87	6,647.87	0.19	0.00	6,651.88
Unmitigated	3.43	15.81	28.36	0.07	6.41	0.51	6.92	0.12	0.47	0.58	0.00	6,647.87	6,647.87	0.19	0.00	6,651.88
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	118.62	128.88	109.26	453,044	453,044
Apartments Mid Rise	2,504.20	2,720.80	2306.60	9,564,253	9,564,253
City Park	57.51	57.51	57.51	141,832	141,832
Elementary School	709.78	0.00	0.00	1,518,513	1,518,513
Single Family Housing	172.26	181.44	157.86	654,353	654,353
Total	3,562.37	3,088.63	2,631.23	12,331,994	12,331,994

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	546.72	546.72	0.02	0.01	550.15
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	546.72	546.72	0.02	0.01	550.15
NaturalGas Mitigated	0.03	0.30	0.14	0.00		0.00	0.02		0.00	0.02	0.00	344.67	344.67	0.01	0.01	346.77
NaturalGas Unmitigated	0.03	0.30	0.14	0.00		0.00	0.02		0.00	0.02	0.00	344.67	344.67	0.01	0.01	346.77
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	257543	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	13.74	13.74	0.00	0.00	13.83
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	457240	0.00	0.02	0.02	0.00		0.00	0.00		0.00	0.00	0.00	24.40	24.40	0.00	0.00	24.55
Single Family Housing	654294	0.00	0.03	0.01	0.00		0.00	0.00		0.00	0.00	0.00	34.92	34.92	0.00	0.00	35.13
Total		**0.03**	**0.29**	**0.14**	**0.00**		**0.00**	**0.02**		**0.00**	**0.02**	**0.00**	**344.67**	**344.67**	**0.01**	**0.00**	**346.77**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	257543	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	13.74	13.74	0.00	0.00	13.83
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	457240	0.00	0.02	0.02	0.00		0.00	0.00		0.00	0.00	0.00	24.40	24.40	0.00	0.00	24.55
Single Family Housing	654294	0.00	0.03	0.01	0.00		0.00	0.00		0.00	0.00	0.00	34.92	34.92	0.00	0.00	35.13
Total		**0.03**	**0.29**	**0.14**	**0.00**		**0.00**	**0.02**		**0.00**	**0.02**	**0.00**	**344.67**	**344.67**	**0.01**	**0.00**	**346.77**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	68856.3					20.03	0.00	0.00	20.16
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	295320					85.91	0.00	0.00	86.45
Single Family Housing	123383					35.89	0.00	0.00	36.12
Total						**546.71**	**0.02**	**0.01**	**550.15**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	68856.3					20.03	0.00	0.00	20.16
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	295320					85.91	0.00	0.00	86.45
Single Family Housing	123383					35.89	0.00	0.00	36.12
Total						**546.71**	**0.02**	**0.01**	**550.15**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	2.45	0.04	3.12	0.00		0.00	0.05		0.00	0.05	0.00	545.73	545.73	0.02	0.01	549.12
Unmitigated	2.79	0.09	6.27	0.01		0.00	0.57		0.00	0.57	68.61	545.75	614.35	0.34	0.01	624.48
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.44					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	1.86					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.40	0.05	3.14	0.01		0.00	0.55		0.00	0.55	68.61	540.64	609.25	0.33	0.01	619.27
Landscaping	0.09	0.04	3.13	0.00		0.00	0.02		0.00	0.02	0.00	5.10	5.10	0.00	0.00	5.21
Total	**2.79**	**0.09**	**6.27**	**0.01**		**0.00**	**0.57**		**0.00**	**0.57**	**68.61**	**545.74**	**614.35**	**0.33**	**0.01**	**624.48**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.44					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	1.86					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.05	0.00	0.00	0.00		0.00	0.04		0.00	0.04	0.00	540.64	540.64	0.01	0.01	543.93
Landscaping	0.09	0.04	3.12	0.00		0.00	0.02		0.00	0.02	0.00	5.09	5.09	0.00	0.00	5.19
Total	**2.44**	**0.04**	**3.12**	**0.00**		**0.00**	**0.06**		**0.00**	**0.06**	**0.00**	**545.73**	**545.73**	**0.01**	**0.01**	**549.12**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					109.85	0.87	0.02	135.44
Unmitigated					109.85	0.87	0.02	135.44
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	1.17277 / 0.739357					2.61	0.04	0.00	3.66
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 43.0959					43.88	0.00	0.00	44.15
Elementary School	1.33386 / 3.42992					5.61	0.04	0.00	6.81
Single Family Housing	1.17277 / 0.739357					2.61	0.04	0.00	3.66
Total						**109.85**	**0.88**	**0.02**	**135.45**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	1.17277 / 0.739357					2.61	0.04	0.00	3.66
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 43.0959					43.88	0.00	0.00	44.15
Elementary School	1.33386 / 3.42992					5.61	0.04	0.00	6.81
Single Family Housing	1.17277 / 0.739357					2.61	0.04	0.00	3.66
Total						**109.85**	**0.88**	**0.02**	**135.45**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					54.29	3.21	0.00	121.66
Unmitigated					54.29	3.21	0.00	121.66
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	8.28					1.68	0.10	0.00	3.77
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	3.11					0.63	0.04	0.00	1.41
Elementary School	59.8					12.14	0.72	0.00	27.20
Single Family Housing	21.45					4.35	0.26	0.00	9.76
Total						**54.28**	**3.22**	**0.00**	**121.66**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	8.28					1.68	0.10	0.00	3.77
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	3.11					0.63	0.04	0.00	1.41
Elementary School	59.8					12.14	0.72	0.00	27.20
Single Family Housing	21.45					4.35	0.26	0.00	9.76
Total						**54.28**	**3.22**	**0.00**	**121.66**

9.0 Vegetation

River Islands Operation - Proposed Project 2022

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
Elementary School	46	1000sqft
City Park	72.33	Acre
Apartments Low Rise	145	Dwelling Unit
Apartments Mid Rise	380	Dwelling Unit
Single Family Housing	141	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Climate Zone 2

Wind Speed (m/s) 2.7

Precipitation Freq (Days) 45

Utility Company Pacific Gas & Electric Company

1.3 User Entered Comments

Project Characteristics -

Land Use -

Construction Phase - Operations only

Vehicle Trips - Fire station assumptions from URBEMIS input.

Woodstoves - No Woodstove per SJVAPCD regulation

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.22	0.06	5.01	0.00		0.00	0.09		0.00	0.09	0.00	873.72	873.72	0.02	0.02	879.15
Energy	0.07	0.59	0.26	0.00		0.00	0.05		0.00	0.05	0.00	1,613.55	1,613.55	0.06	0.03	1,623.54
Mobile	5.32	24.34	43.57	0.12	10.47	0.79	11.26	0.20	0.73	0.92	0.00	10,771.12	10,771.12	0.31	0.00	10,777.54
Waste						0.00	0.00		0.00	0.00	96.56	0.00	96.56	5.71	0.00	216.40
Water						0.00	0.00		0.00	0.00	0.00	190.00	190.00	1.37	0.04	230.35
Total	**9.61**	**24.99**	**48.84**	**0.12**	**10.47**	**0.79**	**11.40**	**0.20**	**0.73**	**1.06**	**96.56**	**13,448.39**	**13,544.95**	**7.47**	**0.09**	**13,726.98**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.22	0.06	5.00	0.00		0.00	0.09		0.00	0.09	0.00	873.69	873.69	0.02	0.02	879.13
Energy	0.07	0.59	0.26	0.00		0.00	0.05		0.00	0.05	0.00	1,613.55	1,613.55	0.06	0.03	1,623.54
Mobile	5.32	24.34	43.57	0.12	10.47	0.79	11.26	0.20	0.73	0.92	0.00	10,771.12	10,771.12	0.31	0.00	10,777.54
Waste						0.00	0.00		0.00	0.00	96.56	0.00	96.56	5.71	0.00	216.40
Water						0.00	0.00		0.00	0.00	0.00	190.00	190.00	1.37	0.04	230.35
Total	**9.61**	**24.99**	**48.83**	**0.12**	**10.47**	**0.79**	**11.40**	**0.20**	**0.73**	**1.06**	**96.56**	**13,448.36**	**13,544.92**	**7.47**	**0.09**	**13,726.96**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	5.32	24.34	43.57	0.12	10.47	0.79	11.26	0.20	0.73	0.92	0.00	10,771.12	10,771.12	0.31	0.00	10,777.54
Unmitigated	5.32	24.34	43.57	0.12	10.47	0.79	11.26	0.20	0.73	0.92	0.00	10,771.12	10,771.12	0.31	0.00	10,777.54
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	955.55	1,038.20	880.15	3,649,518	3,649,518
Apartments Mid Rise	2,504.20	2,720.80	2306.60	9,564,253	9,564,253
City Park	115.00	115.00	115.00	283,625	283,625
Elementary School	709.78	0.00	0.00	1,518,513	1,518,513
Single Family Housing	1,349.37	1,421.28	1236.57	5,125,762	5,125,762
Total	5,633.90	5,295.28	4,538.32	20,141,671	20,141,671

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	933.32	933.32	0.04	0.02	939.17
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	933.32	933.32	0.04	0.02	939.17
NaturalGas Mitigated	0.07	0.59	0.26	0.00		0.00	0.05		0.00	0.05	0.00	680.23	680.23	0.01	0.01	684.37
NaturalGas Unmitigated	0.07	0.59	0.26	0.00		0.00	0.05		0.00	0.05	0.00	680.23	680.23	0.01	0.01	684.37
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.07465e+006	0.01	0.10	0.04	0.00		0.00	0.01		0.00	0.01	0.00	110.71	110.71	0.00	0.00	111.38
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	457240	0.00	0.02	0.02	0.00		0.00	0.00		0.00	0.00	0.00	24.40	24.40	0.00	0.00	24.55
Single Family Housing	5.1253e+006	0.03	0.24	0.10	0.00		0.00	0.02		0.00	0.02	0.00	273.51	273.51	0.01	0.01	275.17
Total		**0.07**	**0.59**	**0.26**	**0.00**		**0.00**	**0.05**		**0.00**	**0.05**	**0.00**	**680.23**	**680.23**	**0.02**	**0.01**	**684.36**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.07465e+006	0.01	0.10	0.04	0.00		0.00	0.01		0.00	0.01	0.00	110.71	110.71	0.00	0.00	111.38
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	457240	0.00	0.02	0.02	0.00		0.00	0.00		0.00	0.00	0.00	24.40	24.40	0.00	0.00	24.55
Single Family Housing	5.1253e+006	0.03	0.24	0.10	0.00		0.00	0.02		0.00	0.02	0.00	273.51	273.51	0.01	0.01	275.17
Total		**0.07**	**0.59**	**0.26**	**0.00**		**0.00**	**0.05**		**0.00**	**0.05**	**0.00**	**680.23**	**680.23**	**0.02**	**0.01**	**684.36**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	554676					161.36	0.01	0.00	162.37
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	295320					85.91	0.00	0.00	86.45
Single Family Housing	966497					281.17	0.01	0.00	282.93
Total						**933.32**	**0.04**	**0.01**	**939.17**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	554676					161.36	0.01	0.00	162.37
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	295320					85.91	0.00	0.00	86.45
Single Family Housing	966497					281.17	0.01	0.00	282.93
Total						**933.32**	**0.04**	**0.01**	**939.17**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.22	0.06	5.00	0.00		0.00	0.09		0.00	0.09	0.00	873.69	873.69	0.02	0.02	879.13
Unmitigated	4.22	0.06	5.01	0.00		0.00	0.09		0.00	0.09	0.00	873.72	873.72	0.02	0.02	879.15
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.76					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	3.22					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.09	0.00	0.00	0.00		0.00	0.06		0.00	0.06	0.00	865.55	865.55	0.02	0.02	870.82
Landscaping	0.15	0.06	5.00	0.00		0.00	0.03		0.00	0.03	0.00	8.17	8.17	0.01	0.00	8.33
Total	**4.22**	**0.06**	**5.00**	**0.00**		**0.00**	**0.09**		**0.00**	**0.09**	**0.00**	**873.72**	**873.72**	**0.03**	**0.02**	**879.15**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.76					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	3.22					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.09	0.00	0.00	0.00		0.00	0.06		0.00	0.06	0.00	865.55	865.55	0.02	0.02	870.82
Landscaping	0.15	0.06	4.99	0.00		0.00	0.03		0.00	0.03	0.00	8.15	8.15	0.01	0.00	8.31
Total	**4.22**	**0.06**	**4.99**	**0.00**		**0.00**	**0.09**		**0.00**	**0.09**	**0.00**	**873.70**	**873.70**	**0.03**	**0.02**	**879.13**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					190.00	1.37	0.04	230.35
Unmitigated					190.00	1.37	0.04	230.35
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	9.44733 / 5.95593					21.04	0.29	0.01	29.45
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 86.1798					87.75	0.00	0.00	88.30
Elementary School	1.33386 / 3.42992					5.61	0.04	0.00	6.81
Single Family Housing	9.18672 / 5.79163					20.46	0.28	0.01	28.63
Total						**190.00**	**1.37**	**0.04**	**230.36**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	9.44733 / 5.95593					21.04	0.29	0.01	29.45
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 86.1798					87.75	0.00	0.00	88.30
Elementary School	1.33386 / 3.42992					5.61	0.04	0.00	6.81
Single Family Housing	9.18672 / 5.79163					20.46	0.28	0.01	28.63
Total						**190.00**	**1.37**	**0.04**	**230.36**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					96.56	5.71	0.00	216.40
Unmitigated					96.56	5.71	0.00	216.40
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	66.7					13.54	0.80	0.00	30.34
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	6.22					1.26	0.07	0.00	2.83
Elementary School	59.8					12.14	0.72	0.00	27.20
Single Family Housing	168.18					34.14	2.02	0.00	76.51
Total						**96.56**	**5.71**	**0.00**	**216.40**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	66.7					13.54	0.80	0.00	30.34
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	6.22					1.26	0.07	0.00	2.83
Elementary School	59.8					12.14	0.72	0.00	27.20
Single Family Housing	168.18					34.14	2.02	0.00	76.51
Total						**96.56**	**5.71**	**0.00**	**216.40**

9.0 Vegetation

River Islands Operation - Proposed Project 2023

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
Elementary School	46	1000sqft
City Park	108.5	Acre
Apartments Low Rise	145	Dwelling Unit
Apartments Mid Rise	380	Dwelling Unit
Single Family Housing	391	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Wind Speed (m/s) 2.7

Utility Company Pacific Gas & Electric Company

Climate Zone 2

Precipitation Freq (Days) 45

1.3 User Entered Comments

Project Characteristics -

Land Use -

Construction Phase - Operations only

Vehicle Trips - Fire station assumptions from URBEMIS input.

Woodstoves - No Woodstove per SJVAPCD regulation

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.03	0.53	0.57	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	0.19	1.51	0.92	0.00	0.01	0.08	0.08	0.00	0.08	0.08	0.00	140.23	140.23	0.02	0.00	140.55
Total	**1.49**	**11.92**	**7.14**	**0.01**	**0.04**	**0.61**	**0.65**	**0.00**	**0.61**	**0.61**	**0.00**	**1,052.36**	**1,052.36**	**0.13**	**0.00**	**1,054.90**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.00	0.53	0.54	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	0.19	1.51	0.92	0.00	0.00	0.08	0.08	0.00	0.08	0.08	0.00	140.23	140.23	0.02	0.00	140.55
Total	**1.49**	**11.92**	**7.14**	**0.01**	**0.00**	**0.61**	**0.62**	**0.00**	**0.61**	**0.61**	**0.00**	**1,052.36**	**1,052.36**	**0.13**	**0.00**	**1,054.90**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	6.49	0.08	6.88	0.00		0.00	0.12		0.00	0.12	0.00	1,201.69	1,201.69	0.03	0.02	1,209.16
Energy	0.12	1.01	0.44	0.01		0.00	0.08		0.00	0.08	0.00	2,597.01	2,597.01	0.09	0.05	2,613.07
Mobile	7.39	33.84	60.31	0.17	15.27	1.11	16.37	0.28	1.01	1.29	0.00	15,585.06	15,585.06	0.44	0.00	15,594.22
Waste						0.00	0.00		0.00	0.00	157.76	0.00	157.76	9.32	0.00	353.55
Water						0.00	0.00		0.00	0.00	0.00	270.16	270.16	1.87	0.05	325.28
Total	**14.00**	**34.93**	**67.63**	**0.18**	**15.27**	**1.11**	**16.57**	**0.28**	**1.01**	**1.49**	**157.76**	**19,653.92**	**19,811.68**	**11.75**	**0.12**	**20,095.28**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	6.49	0.08	6.87	0.00		0.00	0.12		0.00	0.12	0.00	1,201.66	1,201.66	0.03	0.02	1,209.13
Energy	0.12	1.01	0.44	0.01		0.00	0.08		0.00	0.08	0.00	2,597.01	2,597.01	0.09	0.05	2,613.07
Mobile	7.39	33.84	60.31	0.17	15.27	1.11	16.37	0.28	1.01	1.29	0.00	15,585.06	15,585.06	0.44	0.00	15,594.22
Waste						0.00	0.00		0.00	0.00	157.76	0.00	157.76	9.32	0.00	353.55
Water						0.00	0.00		0.00	0.00	0.00	270.16	270.16	1.87	0.05	325.28
Total	**14.00**	**34.93**	**67.62**	**0.18**	**15.27**	**1.11**	**16.57**	**0.28**	**1.01**	**1.49**	**157.76**	**19,653.89**	**19,811.65**	**11.75**	**0.12**	**20,095.25**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.28	10.38	5.97	0.01		0.53	0.53		0.53	0.53	0.00	885.54	885.54	0.10	0.00	887.72
Total	**1.28**	**10.38**	**5.97**	**0.01**		**0.53**	**0.53**		**0.53**	**0.53**	**0.00**	**885.54**	**885.54**	**0.10**	**0.00**	**887.72**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.02	0.03	0.25	0.00	0.03	0.00	0.04	0.00	0.00	0.00	0.00	26.59	26.59	0.00	0.00	26.63
Total	**0.02**	**0.03**	**0.25**	**0.00**	**0.03**	**0.00**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**26.59**	**26.59**	**0.00**	**0.00**	**26.63**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.28	10.38	5.97	0.01		0.53	0.53		0.53	0.53	0.00	885.54	885.54	0.10	0.00	887.72
Total	**1.28**	**10.38**	**5.97**	**0.01**		**0.53**	**0.53**		**0.53**	**0.53**	**0.00**	**885.54**	**885.54**	**0.10**	**0.00**	**887.72**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.02	0.03	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.59	26.59	0.00	0.00	26.63
Total	**0.02**	**0.03**	**0.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**26.59**	**26.59**	**0.00**	**0.00**	**26.63**

3.2 Demolition - 2012

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.19	1.50	0.88	0.00		0.08	0.08		0.08	0.08	0.00	136.24	136.24	0.02	0.00	136.55
Total	**0.19**	**1.50**	**0.88**	**0.00**		**0.08**	**0.08**		**0.08**	**0.08**	**0.00**	**136.24**	**136.24**	**0.02**	**0.00**	**136.55**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	3.99	3.99	0.00	0.00	4.00
Total	**0.00**	**0.00**	**0.03**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**3.99**	**3.99**	**0.00**	**0.00**	**4.00**

3.2 Demolition - 2012

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.19	1.50	0.88	0.00		0.08	0.08		0.08	0.08	0.00	136.24	136.24	0.02	0.00	136.55
Total	**0.19**	**1.50**	**0.88**	**0.00**		**0.08**	**0.08**		**0.08**	**0.08**	**0.00**	**136.24**	**136.24**	**0.02**	**0.00**	**136.55**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.99	3.99	0.00	0.00	4.00
Total	**0.00**	**0.00**	**0.03**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.99**	**3.99**	**0.00**	**0.00**	**4.00**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	7.39	33.84	60.31	0.17	15.27	1.11	16.37	0.28	1.01	1.29	0.00	15,585.06	15,585.06	0.44	0.00	15,594.22
Unmitigated	7.39	33.84	60.31	0.17	15.27	1.11	16.37	0.28	1.01	1.29	0.00	15,585.06	15,585.06	0.44	0.00	15,594.22
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	955.55	1,038.20	880.15	3,649,518	3,649,518
Apartments Mid Rise	2,504.20	2,720.80	2306.60	9,564,253	9,564,253
City Park	172.52	172.52	172.52	425,457	425,457
Elementary School	709.78	0.00	0.00	1,518,513	1,518,513
Single Family Housing	3,741.87	3,941.28	3429.07	14,213,994	14,213,994
Total	8,083.92	7,872.80	6,788.34	29,371,734	29,371,734

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	1,431.84	1,431.84	0.06	0.02	1,440.81
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	1,431.84	1,431.84	0.06	0.02	1,440.81
NaturalGas Mitigated	0.12	1.01	0.44	0.01		0.00	0.08		0.00	0.08	0.00	1,165.17	1,165.17	0.02	0.02	1,172.26
NaturalGas Unmitigated	0.12	1.01	0.44	0.01		0.00	0.08		0.00	0.08	0.00	1,165.17	1,165.17	0.02	0.02	1,172.26
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.07465e+006	0.01	0.10	0.04	0.00		0.00	0.01		0.00	0.01	0.00	110.71	110.71	0.00	0.00	111.38
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	457240	0.00	0.02	0.02	0.00		0.00	0.00		0.00	0.00	0.00	24.40	24.40	0.00	0.00	24.55
Single Family Housing	1.42127e+007	0.08	0.65	0.28	0.00		0.00	0.05		0.00	0.05	0.00	758.44	758.44	0.01	0.01	763.06
Total		**0.12**	**1.00**	**0.44**	**0.00**		**0.00**	**0.08**		**0.00**	**0.08**	**0.00**	**1,165.16**	**1,165.16**	**0.02**	**0.01**	**1,172.25**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.07465e+006	0.01	0.10	0.04	0.00		0.00	0.01		0.00	0.01	0.00	110.71	110.71	0.00	0.00	111.38
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	457240	0.00	0.02	0.02	0.00		0.00	0.00		0.00	0.00	0.00	24.40	24.40	0.00	0.00	24.55
Single Family Housing	1.42127e+007	0.08	0.65	0.28	0.00		0.00	0.05		0.00	0.05	0.00	758.44	758.44	0.01	0.01	763.06
Total		**0.12**	**1.00**	**0.44**	**0.00**		**0.00**	**0.08**		**0.00**	**0.08**	**0.00**	**1,165.16**	**1,165.16**	**0.02**	**0.01**	**1,172.25**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	554676					161.36	0.01	0.00	162.37
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	295320					85.91	0.00	0.00	86.45
Single Family Housing	2.68014e+006					779.68	0.04	0.01	784.57
Total						**1,431.83**	**0.07**	**0.02**	**1,440.81**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	554676					161.36	0.01	0.00	162.37
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	295320					85.91	0.00	0.00	86.45
Single Family Housing	2.68014e+006					779.68	0.04	0.01	784.57
Total						**1,431.83**	**0.07**	**0.02**	**1,440.81**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	6.49	0.08	6.87	0.00		0.00	0.12		0.00	0.12	0.00	1,201.66	1,201.66	0.03	0.02	1,209.13
Unmitigated	6.49	0.08	6.88	0.00		0.00	0.12		0.00	0.12	0.00	1,201.69	1,201.69	0.03	0.02	1,209.16
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.18					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	4.98					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.12	0.00	0.01	0.00		0.00	0.08		0.00	0.08	0.00	1,190.45	1,190.45	0.02	0.02	1,197.70
Landscaping	0.21	0.08	6.88	0.00		0.00	0.04		0.00	0.04	0.00	11.24	11.24	0.01	0.00	11.46
Total	**6.49**	**0.08**	**6.89**	**0.00**		**0.00**	**0.12**		**0.00**	**0.12**	**0.00**	**1,201.69**	**1,201.69**	**0.03**	**0.02**	**1,209.16**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.18					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	4.98					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.12	0.00	0.01	0.00		0.00	0.08		0.00	0.08	0.00	1,190.45	1,190.45	0.02	0.02	1,197.70
Landscaping	0.21	0.08	6.86	0.00		0.00	0.04		0.00	0.04	0.00	11.20	11.20	0.01	0.00	11.43
Total	**6.49**	**0.08**	**6.87**	**0.00**		**0.00**	**0.12**		**0.00**	**0.12**	**0.00**	**1,201.65**	**1,201.65**	**0.03**	**0.02**	**1,209.13**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					270.16	1.87	0.05	325.28
Unmitigated					270.16	1.87	0.05	325.28
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	9.44733 / 5.95593					21.04	0.29	0.01	29.45
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 129.276					131.63	0.01	0.00	132.45
Elementary School	1.33386 / 3.42992					5.61	0.04	0.00	6.81
Single Family Housing	25.4752 / 16.0605					56.74	0.78	0.02	79.40
Total						**270.16**	**1.88**	**0.05**	**325.28**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	9.44733 / 5.95593					21.04	0.29	0.01	29.45
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 129.276					131.63	0.01	0.00	132.45
Elementary School	1.33386 / 3.42992					5.61	0.04	0.00	6.81
Single Family Housing	25.4752 / 16.0605					56.74	0.78	0.02	79.40
Total						**270.16**	**1.88**	**0.05**	**325.28**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					157.76	9.32	0.00	353.55
Unmitigated					157.76	9.32	0.00	353.55
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	66.7					13.54	0.80	0.00	30.34
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	9.33					1.89	0.11	0.00	4.24
Elementary School	59.8					12.14	0.72	0.00	27.20
Single Family Housing	466.55					94.71	5.60	0.00	212.24
Total						**157.76**	**9.33**	**0.00**	**353.54**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	66.7					13.54	0.80	0.00	30.34
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	9.33					1.89	0.11	0.00	4.24
Elementary School	59.8					12.14	0.72	0.00	27.20
Single Family Housing	466.55					94.71	5.60	0.00	212.24
Total						**157.76**	**9.33**	**0.00**	**353.54**

9.0 Vegetation

River Islands Operation - Proposed Project 2024

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
Elementary School	92	1000sqft
City Park	144.67	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	495	Dwelling Unit
Apartments Mid Rise	380	Dwelling Unit
Single Family Housing	541	Dwelling Unit

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	2	**Precipitation Freq (Days)**	45		

1.3 User Entered Comments

Project Characteristics -

Land Use - No fire stations or junior high yet in this year.

Construction Phase - Construction is not included in this operational analysis.

Vehicle Trips - Fire station assumptions from URBEMIS input.

Area Mitigation - Here we assume electric lawnmowers, leafblowers, and chainsaws make up 3% of landscape equipment equally.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

2.2 Overall Operational

<u>Unmitigated Operational</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	14.37	0.78	50.72	0.13		0.00	6.73		0.00	6.73	875.61	1,857.63	2,733.25	4.15	0.03	2,830.76
Energy	0.18	1.53	0.67	0.01		0.00	0.12		0.00	0.12	0.00	4,010.09	4,010.09	0.14	0.07	4,034.91
Mobile	11.65	53.66	94.60	0.28	24.80	1.73	26.52	0.46	1.57	2.03	0.00	25,192.78	25,192.78	0.70	0.00	25,207.50
Waste						0.00	0.00		0.00	0.00	285.24	0.00	285.24	16.86	0.00	639.24
Water						0.00	0.00		0.00	0.00	0.00	576.14	576.14	2.95	0.08	663.64
Total	**26.20**	**55.97**	**145.99**	**0.42**	**24.80**	**1.73**	**33.37**	**0.46**	**1.57**	**8.88**	**1,160.85**	**31,636.64**	**32,797.50**	**24.80**	**0.18**	**33,376.05**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	9.95	0.12	10.61	0.00		0.00	0.19		0.00	0.19	0.00	1,857.58	1,857.58	0.05	0.03	1,869.13
Energy	0.18	1.53	0.67	0.01		0.00	0.12		0.00	0.12	0.00	4,010.09	4,010.09	0.14	0.07	4,034.91
Mobile	11.65	53.66	94.60	0.28	24.80	1.73	26.52	0.46	1.57	2.03	0.00	25,192.78	25,192.78	0.70	0.00	25,207.50
Waste						0.00	0.00		0.00	0.00	285.24	0.00	285.24	16.86	0.00	639.24
Water						0.00	0.00		0.00	0.00	0.00	576.14	576.14	2.95	0.08	663.64
Total	**21.78**	**55.31**	**105.88**	**0.29**	**24.80**	**1.73**	**26.83**	**0.46**	**1.57**	**2.34**	**285.24**	**31,636.59**	**31,921.83**	**20.70**	**0.18**	**32,414.42**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	11.65	53.66	94.60	0.28	24.80	1.73	26.52	0.46	1.57	2.03	0.00	25,192.78	25,192.78	0.70	0.00	25,207.50
Unmitigated	11.65	53.66	94.60	0.28	24.80	1.73	26.52	0.46	1.57	2.03	0.00	25,192.78	25,192.78	0.70	0.00	25,207.50
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	3,262.05	3,544.20	3004.65	12,458,698	12,458,698
Apartments Mid Rise	2,504.20	2,720.80	2306.60	9,564,253	9,564,253
City Park	230.03	230.03	230.03	567,290	567,290
Elementary School	1,419.56	0.00	0.00	3,037,025	3,037,025
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	5,177.37	5,453.28	4744.57	19,666,932	19,666,932
Total	13,843.16	13,134.36	11,568.80	47,716,305	47,716,305

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	2,246.63	2,246.63	0.10	0.04	2,260.71
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	2,246.63	2,246.63	0.10	0.04	2,260.71
NaturalGas Mitigated	0.18	1.53	0.67	0.01		0.00	0.12		0.00	0.12	0.00	1,763.46	1,763.46	0.03	0.03	1,774.19
NaturalGas Unmitigated	0.18	1.53	0.67	0.01		0.00	0.12		0.00	0.12	0.00	1,763.46	1,763.46	0.03	0.03	1,774.19
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	7.08243e+006	0.04	0.33	0.14	0.00		0.00	0.03		0.00	0.03	0.00	377.95	377.95	0.01	0.01	380.25
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	1.96652e+007	0.11	0.91	0.39	0.01		0.00	0.07		0.00	0.07	0.00	1,049.41	1,049.41	0.02	0.02	1,055.79
Total		**0.18**	**1.52**	**0.68**	**0.01**		**0.00**	**0.12**		**0.00**	**0.12**	**0.00**	**1,763.47**	**1,763.47**	**0.04**	**0.03**	**1,774.19**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	7.08243e+006	0.04	0.33	0.14	0.00		0.00	0.03		0.00	0.03	0.00	377.95	377.95	0.01	0.01	380.25
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	1.96652e+007	0.11	0.91	0.39	0.01		0.00	0.07		0.00	0.07	0.00	1,049.41	1,049.41	0.02	0.02	1,055.79
Total		**0.18**	**1.52**	**0.68**	**0.01**		**0.00**	**0.12**		**0.00**	**0.12**	**0.00**	**1,763.47**	**1,763.47**	**0.04**	**0.03**	**1,774.19**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	1.89355e+006					550.85	0.02	0.01	554.31
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	3.70833e+006					1,078.80	0.05	0.02	1,085.56
Total						**2,246.63**	**0.10**	**0.04**	**2,260.72**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	1.89355e+006					550.85	0.02	0.01	554.31
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	3.70833e+006					1,078.80	0.05	0.02	1,085.56
Total						**2,246.63**	**0.10**	**0.04**	**2,260.72**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	9.95	0.12	10.61	0.00		0.00	0.19		0.00	0.19	0.00	1,857.58	1,857.58	0.05	0.03	1,869.13
Unmitigated	14.37	0.78	50.72	0.13		0.00	6.73		0.00	6.73	875.61	1,857.63	2,733.25	4.15	0.03	2,830.76
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

<u>Unmitigated</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.81					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	7.64					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	4.60	0.65	40.10	0.13		0.00	6.67		0.00	6.67	875.61	1,840.27	2,715.88	4.13	0.03	2,813.04
Landscaping	0.32	0.12	10.62	0.00		0.00	0.06		0.00	0.06	0.00	17.37	17.37	0.02	0.00	17.72
Total	**14.37**	**0.77**	**50.72**	**0.13**		**0.00**	**6.73**		**0.00**	**6.73**	**875.61**	**1,857.64**	**2,733.25**	**4.15**	**0.03**	**2,830.76**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.81					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	7.64					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.19	0.00	0.01	0.00		0.00	0.13		0.00	0.13	0.00	1,840.27	1,840.27	0.04	0.03	1,851.46
Landscaping	0.32	0.12	10.60	0.00		0.00	0.06		0.00	0.06	0.00	17.32	17.32	0.02	0.00	17.67
Total	**9.96**	**0.12**	**10.61**	**0.00**		**0.00**	**0.19**		**0.00**	**0.19**	**0.00**	**1,857.59**	**1,857.59**	**0.06**	**0.03**	**1,869.13**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					576.14	2.95	0.08	663.64
Unmitigated					576.14	2.95	0.08	663.64
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	32.2512 / 20.3323					71.83	0.99	0.03	100.52
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	35.2483 / 22.2218					78.51	1.08	0.03	109.86
Total						**576.13**	**2.96**	**0.08**	**663.64**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	32.2512 / 20.3323					71.83	0.99	0.03	100.52
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	35.2483 / 22.2218					78.51	1.08	0.03	109.86
Total						**576.13**	**2.96**	**0.08**	**663.64**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					285.24	16.86	0.00	639.24
Unmitigated					285.24	16.86	0.00	639.24
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	227.7					46.22	2.73	0.00	103.58
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	645.64					131.06	7.75	0.00	293.71
Total						**285.25**	**16.86**	**0.00**	**639.24**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	227.7					46.22	2.73	0.00	103.58
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	645.64					131.06	7.75	0.00	293.71
Total						**285.25**	**16.86**	**0.00**	**639.24**

9.0 Vegetation

River Islands Operation - Proposed Project 2025

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
Elementary School	92	1000sqft
Junior High School	64	1000sqft
City Park	144.67	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	795	Dwelling Unit
Apartments Mid Rise	380	Dwelling Unit
Single Family Housing	541	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural **Wind Speed (m/s)** 2.7 **Utility Company** Pacific Gas & Electric Company

Climate Zone 2 **Precipitation Freq (Days)** 45

1.3 User Entered Comments

Project Characteristics -

Land Use - No fire stations yet in this year.

Construction Phase - Construction is not included in this operational analysis.

Vehicle Trips - Fire station assumptions from URBEMIS input.

Area Mitigation - Here we assume electric lawnmowers, leafblowers, and chainsaws make up 3% of landscape equipment equally.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	16.60	0.86	56.43	0.14		0.00	7.33		0.00	7.33	951.41	2,251.20	3,202.62	4.51	0.04	3,310.01
Energy	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	4,726.48	4,726.48	0.16	0.08	4,755.73
Mobile	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Waste						0.00	0.00		0.00	0.00	330.14	0.00	330.14	19.51	0.00	739.87
Water						0.00	0.00		0.00	0.00	0.00	625.22	625.22	3.59	0.10	731.30
Total	**30.35**	**64.51**	**166.01**	**0.49**	**29.76**	**1.97**	**39.20**	**0.55**	**1.80**	**9.82**	**1,281.55**	**37,608.04**	**38,889.60**	**28.54**	**0.22**	**39,558.13**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	11.80	0.15	12.85	0.00		0.00	0.23		0.00	0.22	0.00	2,251.14	2,251.14	0.06	0.04	2,265.13
Energy	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	4,726.48	4,726.48	0.16	0.08	4,755.73
Mobile	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Waste						0.00	0.00		0.00	0.00	330.14	0.00	330.14	19.51	0.00	739.87
Water						0.00	0.00		0.00	0.00	0.00	625.22	625.22	3.59	0.10	731.30
Total	**25.55**	**63.80**	**122.43**	**0.35**	**29.76**	**1.97**	**32.10**	**0.55**	**1.80**	**2.71**	**330.14**	**37,607.98**	**37,938.12**	**24.09**	**0.22**	**38,513.25**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Unmitigated	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	5,239.05	5,692.20	4825.65	20,009,424	20,009,424
Apartments Mid Rise	2,504.20	2,720.80	2306.60	9,564,253	9,564,253
City Park	230.03	230.03	230.03	567,290	567,290
Elementary School	1,419.56	0.00	0.00	3,037,025	3,037,025
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	5,177.37	5,453.28	4744.57	19,666,932	19,666,932
Total	16,702.08	15,282.36	13,389.80	57,254,145	57,254,145

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	2,700.02	2,700.02	0.12	0.05	2,716.94
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	2,700.02	2,700.02	0.12	0.05	2,716.94
NaturalGas Mitigated	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	2,026.47	2,026.47	0.04	0.04	2,038.80
NaturalGas Unmitigated	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	2,026.47	2,026.47	0.04	0.04	2,038.80
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.13748e+007	0.06	0.52	0.22	0.00		0.00	0.04		0.00	0.04	0.00	607.00	607.00	0.01	0.01	610.70
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	1.96652e+007	0.11	0.91	0.39	0.01		0.00	0.07		0.00	0.07	0.00	1,049.41	1,049.41	0.02	0.02	1,055.79
Total		**0.20**	**1.74**	**0.79**	**0.01**		**0.00**	**0.13**		**0.00**	**0.13**	**0.00**	**2,026.47**	**2,026.47**	**0.04**	**0.03**	**2,038.79**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.13748e+007	0.06	0.52	0.22	0.00		0.00	0.04		0.00	0.04	0.00	607.00	607.00	0.01	0.01	610.70
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	1.96652e+007	0.11	0.91	0.39	0.01		0.00	0.07		0.00	0.07	0.00	1,049.41	1,049.41	0.02	0.02	1,055.79
Total		**0.20**	**1.74**	**0.79**	**0.01**		**0.00**	**0.13**		**0.00**	**0.13**	**0.00**	**2,026.47**	**2,026.47**	**0.04**	**0.03**	**2,038.79**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.04115e+006					884.71	0.04	0.02	890.25
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	3.70833e+006					1,078.80	0.05	0.02	1,085.56
Total						**2,700.02**	**0.13**	**0.05**	**2,716.94**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.04115e+006					884.71	0.04	0.02	890.25
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	3.70833e+006					1,078.80	0.05	0.02	1,085.56
Total						**2,700.02**	**0.13**	**0.05**	**2,716.94**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	11.80	0.15	12.85	0.00		0.00	0.23		0.00	0.22	0.00	2,251.14	2,251.14	0.06	0.04	2,265.13
Unmitigated	16.60	0.86	56.43	0.14		0.00	7.33		0.00	7.33	951.41	2,251.20	3,202.62	4.51	0.04	3,310.01
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.13					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	9.06					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	5.02	0.71	43.57	0.14		0.00	7.26		0.00	7.26	951.41	2,230.15	3,181.57	4.49	0.04	3,288.54
Landscaping	0.39	0.15	12.87	0.00		0.00	0.07		0.00	0.07	0.00	21.05	21.05	0.02	0.00	21.47
Total	**16.60**	**0.86**	**56.44**	**0.14**		**0.00**	**7.33**		**0.00**	**7.33**	**951.41**	**2,251.20**	**3,202.62**	**4.51**	**0.04**	**3,310.01**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.13					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	9.06					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.23	0.00	0.01	0.00		0.00	0.16		0.00	0.15	0.00	2,230.15	2,230.15	0.04	0.04	2,243.72
Landscaping	0.38	0.15	12.84	0.00		0.00	0.07		0.00	0.07	0.00	20.99	20.99	0.02	0.00	21.41
Total	**11.80**	**0.15**	**12.85**	**0.00**		**0.00**	**0.23**		**0.00**	**0.22**	**0.00**	**2,251.14**	**2,251.14**	**0.06**	**0.04**	**2,265.13**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					625.22	3.59	0.10	731.30
Unmitigated					625.22	3.59	0.10	731.30
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	51.7975 / 32.6549					115.37	1.59	0.04	161.44
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	35.2483 / 22.2218					78.51	1.08	0.03	109.86
Total						**625.22**	**3.60**	**0.09**	**731.30**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	51.7975 / 32.6549					115.37	1.59	0.04	161.44
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	35.2483 / 22.2218					78.51	1.08	0.03	109.86
Total						**625.22**	**3.60**	**0.09**	**731.30**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					330.14	19.51	0.00	739.87
Unmitigated					330.14	19.51	0.00	739.87
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	365.7					74.23	4.39	0.00	166.36
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	645.64					131.06	7.75	0.00	293.71
Total						**330.15**	**19.52**	**0.00**	**739.87**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	365.7					74.23	4.39	0.00	166.36
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	645.64					131.06	7.75	0.00	293.71
Total						**330.15**	**19.52**	**0.00**	**739.87**

9.0 Vegetation

River Islands Operation - Proposed Project 2026

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	10	User Defined Unit
Elementary School	92	1000sqft
Junior High School	64	1000sqft
City Park	144.67	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	795	Dwelling Unit
Apartments Mid Rise	380	Dwelling Unit
Single Family Housing	541	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Wind Speed (m/s) 2.7

Utility Company Pacific Gas & Electric Company

Climate Zone 2

Precipitation Freq (Days) 45

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - Construction is not including in this operational analysis.

Vehicle Trips - Fire station assumptions from URBEMIS input.

Area Mitigation - Here we assume lawnmowers, leafblowers, and chainsaws make up all 3 % equally.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.03	0.53	0.57	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	1.24	9.83	5.99	0.01	0.03	0.50	0.53	0.00	0.50	0.50	0.00	915.00	915.00	0.10	0.00	917.11
2013	0.36	2.80	1.74	0.00	0.01	0.14	0.15	0.00	0.14	0.14	0.00	276.77	276.77	0.03	0.00	277.38
Total	**2.90**	**23.04**	**13.95**	**0.02**	**0.07**	**1.17**	**1.25**	**0.00**	**1.17**	**1.17**	**0.00**	**2,103.90**	**2,103.90**	**0.24**	**0.00**	**2,108.84**

2.1 Overall Construction

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.00	0.53	0.54	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	1.24	9.83	5.99	0.01	0.00	0.50	0.50	0.00	0.50	0.50	0.00	915.00	915.00	0.10	0.00	917.11
2013	0.36	2.80	1.74	0.00	0.00	0.14	0.14	0.00	0.14	0.14	0.00	276.77	276.77	0.03	0.00	277.38
Total	**2.90**	**23.04**	**13.95**	**0.02**	**0.00**	**1.17**	**1.18**	**0.00**	**1.17**	**1.17**	**0.00**	**2,103.90**	**2,103.90**	**0.24**	**0.00**	**2,108.84**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	16.65	0.86	56.43	0.14		0.00	7.33		0.00	7.33	951.41	2,251.20	3,202.62	4.51	0.04	3,310.01
Energy	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	4,726.48	4,726.48	0.16	0.08	4,755.73
Mobile	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Waste						0.00	0.00		0.00	0.00	330.14	0.00	330.14	19.51	0.00	739.87
Water						0.00	0.00		0.00	0.00	0.00	625.22	625.22	3.59	0.10	731.30
Total	**30.40**	**64.51**	**166.01**	**0.49**	**29.76**	**1.97**	**39.20**	**0.55**	**1.80**	**9.82**	**1,281.55**	**37,608.04**	**38,889.60**	**28.54**	**0.22**	**39,558.13**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	11.85	0.15	12.85	0.00		0.00	0.23		0.00	0.22	0.00	2,251.14	2,251.14	0.06	0.04	2,265.13
Energy	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	4,726.48	4,726.48	0.16	0.08	4,755.73
Mobile	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Waste						0.00	0.00		0.00	0.00	330.14	0.00	330.14	19.51	0.00	739.87
Water						0.00	0.00		0.00	0.00	0.00	625.22	625.22	3.59	0.10	731.30
Total	**25.60**	**63.80**	**122.43**	**0.35**	**29.76**	**1.97**	**32.10**	**0.55**	**1.80**	**2.71**	**330.14**	**37,607.98**	**37,938.12**	**24.09**	**0.22**	**38,513.25**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.28	10.38	5.97	0.01		0.53	0.53		0.53	0.53	0.00	885.54	885.54	0.10	0.00	887.72
Total	**1.28**	**10.38**	**5.97**	**0.01**		**0.53**	**0.53**		**0.53**	**0.53**	**0.00**	**885.54**	**885.54**	**0.10**	**0.00**	**887.72**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.02	0.03	0.25	0.00	0.03	0.00	0.04	0.00	0.00	0.00	0.00	26.59	26.59	0.00	0.00	26.63
Total	**0.02**	**0.03**	**0.25**	**0.00**	**0.03**	**0.00**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**26.59**	**26.59**	**0.00**	**0.00**	**26.63**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.28	10.38	5.97	0.01		0.53	0.53		0.53	0.53	0.00	885.54	885.54	0.10	0.00	887.72
Total	**1.28**	**10.38**	**5.97**	**0.01**		**0.53**	**0.53**		**0.53**	**0.53**	**0.00**	**885.54**	**885.54**	**0.10**	**0.00**	**887.72**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.02	0.03	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.59	26.59	0.00	0.00	26.63
Total	**0.02**	**0.03**	**0.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**26.59**	**26.59**	**0.00**	**0.00**	**26.63**

3.2 Demolition - 2012

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.22	9.80	5.77	0.01		0.50	0.50		0.50	0.50	0.00	888.94	888.94	0.10	0.00	891.02
Total	**1.22**	**9.80**	**5.77**	**0.01**		**0.50**	**0.50**		**0.50**	**0.50**	**0.00**	**888.94**	**888.94**	**0.10**	**0.00**	**891.02**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.02	0.02	0.22	0.00	0.03	0.00	0.04	0.00	0.00	0.00	0.00	26.05	26.05	0.00	0.00	26.09
Total	**0.02**	**0.02**	**0.22**	**0.00**	**0.03**	**0.00**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**26.05**	**26.05**	**0.00**	**0.00**	**26.09**

3.2 Demolition - 2012

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.22	9.80	5.77	0.01		0.50	0.50		0.50	0.50	0.00	888.94	888.94	0.10	0.00	891.02
Total	**1.22**	**9.80**	**5.77**	**0.01**		**0.50**	**0.50**		**0.50**	**0.50**	**0.00**	**888.94**	**888.94**	**0.10**	**0.00**	**891.02**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.02	0.02	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.05	26.05	0.00	0.00	26.09
Total	**0.02**	**0.02**	**0.22**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**26.05**	**26.05**	**0.00**	**0.00**	**26.09**

3.2 Demolition - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.35	2.79	1.68	0.00		0.14	0.14		0.14	0.14	0.00	269.07	269.07	0.03	0.00	269.67
Total	**0.35**	**2.79**	**1.68**	**0.00**		**0.14**	**0.14**		**0.14**	**0.14**	**0.00**	**269.07**	**269.07**	**0.03**	**0.00**	**269.67**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.01	0.01	0.06	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	7.70	7.70	0.00	0.00	7.71
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.01**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**7.70**	**7.70**	**0.00**	**0.00**	**7.71**

3.2 Demolition - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.35	2.79	1.68	0.00		0.14	0.14		0.14	0.14	0.00	269.07	269.07	0.03	0.00	269.67
Total	**0.35**	**2.79**	**1.68**	**0.00**		**0.14**	**0.14**		**0.14**	**0.14**	**0.00**	**269.07**	**269.07**	**0.03**	**0.00**	**269.67**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.01	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.70	7.70	0.00	0.00	7.71
Total	**0.01**	**0.01**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.70**	**7.70**	**0.00**	**0.00**	**7.71**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Unmitigated	13.55	61.89	108.80	0.34	29.76	1.97	31.73	0.55	1.80	2.35	0.00	30,005.14	30,005.14	0.77	0.00	30,021.22
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	5,239.05	5,692.20	4825.65	20,009,424	20,009,424
Apartments Mid Rise	2,504.20	2,720.80	2306.60	9,564,253	9,564,253
City Park	230.03	230.03	230.03	567,290	567,290
Elementary School	1,419.56	0.00	0.00	3,037,025	3,037,025
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	5,177.37	5,453.28	4744.57	19,666,932	19,666,932
User Defined Commercial	0.00	0.00	0.00		
Total	16,702.08	15,282.36	13,389.80	57,254,145	57,254,145

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
User Defined Commercial	14.70	6.60	6.60	0.00	0.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	2,700.02	2,700.02	0.12	0.05	2,716.94
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	2,700.02	2,700.02	0.12	0.05	2,716.94
NaturalGas Mitigated	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	2,026.47	2,026.47	0.04	0.04	2,038.80
NaturalGas Unmitigated	0.20	1.76	0.78	0.01		0.00	0.14		0.00	0.14	0.00	2,026.47	2,026.47	0.04	0.04	2,038.80
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.13748e+007	0.06	0.52	0.22	0.00		0.00	0.04		0.00	0.04	0.00	607.00	607.00	0.01	0.01	610.70
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	1.96652e+007	0.11	0.91	0.39	0.01		0.00	0.07		0.00	0.07	0.00	1,049.41	1,049.41	0.02	0.02	1,055.79
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.20**	**1.74**	**0.79**	**0.01**		**0.00**	**0.13**		**0.00**	**0.13**	**0.00**	**2,026.47**	**2,026.47**	**0.04**	**0.03**	**2,038.79**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.13748e+007	0.06	0.52	0.22	0.00		0.00	0.04		0.00	0.04	0.00	607.00	607.00	0.01	0.01	610.70
Apartments Mid Rise	5.08977e+006	0.03	0.23	0.10	0.00		0.00	0.02		0.00	0.02	0.00	271.61	271.61	0.01	0.00	273.26
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	1.96652e+007	0.11	0.91	0.39	0.01		0.00	0.07		0.00	0.07	0.00	1,049.41	1,049.41	0.02	0.02	1,055.79
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.20**	**1.74**	**0.79**	**0.01**		**0.00**	**0.13**		**0.00**	**0.13**	**0.00**	**2,026.47**	**2,026.47**	**0.04**	**0.03**	**2,038.79**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.04115e+006					884.71	0.04	0.02	890.25
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	3.70833e+006					1,078.80	0.05	0.02	1,085.56
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**2,700.02**	**0.13**	**0.05**	**2,716.94**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.04115e+006					884.71	0.04	0.02	890.25
Apartments Mid Rise	1.39177e+006					404.88	0.02	0.01	407.42
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	3.70833e+006					1,078.80	0.05	0.02	1,085.56
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**2,700.02**	**0.13**	**0.05**	**2,716.94**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	11.85	0.15	12.85	0.00		0.00	0.23		0.00	0.22	0.00	2,251.14	2,251.14	0.06	0.04	2,265.13
Unmitigated	16.65	0.86	56.43	0.14		0.00	7.33		0.00	7.33	951.41	2,251.20	3,202.62	4.51	0.04	3,310.01
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.14					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	9.10					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	5.02	0.71	43.57	0.14		0.00	7.26		0.00	7.26	951.41	2,230.15	3,181.57	4.49	0.04	3,288.54
Landscaping	0.39	0.15	12.87	0.00		0.00	0.07		0.00	0.07	0.00	21.05	21.05	0.02	0.00	21.47
Total	**16.65**	**0.86**	**56.44**	**0.14**		**0.00**	**7.33**		**0.00**	**7.33**	**951.41**	**2,251.20**	**3,202.62**	**4.51**	**0.04**	**3,310.01**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.14					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	9.10					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.23	0.00	0.01	0.00		0.00	0.16		0.00	0.15	0.00	2,230.15	2,230.15	0.04	0.04	2,243.72
Landscaping	0.38	0.15	12.84	0.00		0.00	0.07		0.00	0.07	0.00	20.99	20.99	0.02	0.00	21.41
Total	**11.85**	**0.15**	**12.85**	**0.00**		**0.00**	**0.23**		**0.00**	**0.22**	**0.00**	**2,251.14**	**2,251.14**	**0.06**	**0.04**	**2,265.13**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					625.22	3.59	0.10	731.30
Unmitigated					625.22	3.59	0.10	731.30
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	51.7975 / 32.6549					115.37	1.59	0.04	161.44
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	35.2483 / 22.2218					78.51	1.08	0.03	109.86
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**625.22**	**3.60**	**0.09**	**731.30**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	51.7975 / 32.6549					115.37	1.59	0.04	161.44
Apartments Mid Rise	24.7585 / 15.6086					55.14	0.76	0.02	77.17
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	35.2483 / 22.2218					78.51	1.08	0.03	109.86
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**625.22**	**3.60**	**0.09**	**731.30**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					330.14	19.51	0.00	739.87
Unmitigated					330.14	19.51	0.00	739.87
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	365.7					74.23	4.39	0.00	166.36
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	645.64					131.06	7.75	0.00	293.71
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**330.15**	**19.52**	**0.00**	**739.87**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	365.7					74.23	4.39	0.00	166.36
Apartments Mid Rise	174.8					35.48	2.10	0.00	79.52
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	645.64					131.06	7.75	0.00	293.71
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**330.15**	**19.52**	**0.00**	**739.87**

9.0 Vegetation

River Islands Operation - Proposed Project 2027

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	10	User Defined Unit
Elementary School	92	1000sqft
Junior High School	64	1000sqft
City Park	144.67	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	883	Dwelling Unit
Apartments Mid Rise	530	Dwelling Unit
Single Family Housing	966	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural **Wind Speed (m/s)** 2.7 **Utility Company** Pacific Gas & Electric Company

Climate Zone 2 **Precipitation Freq (Days)** 45

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.03	0.53	0.57	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	1.24	9.83	5.99	0.01	0.03	0.50	0.53	0.00	0.50	0.50	0.00	915.00	915.00	0.10	0.00	917.11
2013	1.22	9.63	5.88	0.01	3.83	0.48	4.31	2.09	0.48	2.56	0.00	934.08	934.08	0.10	0.00	936.17
2014	1.24	9.79	5.83	0.01	3.83	0.47	4.31	2.09	0.47	2.56	0.00	976.36	976.36	0.10	0.00	978.48
2015	1.33	10.36	6.29	0.01	8.54	0.48	9.02	4.04	0.48	4.51	0.00	1,216.42	1,216.42	0.11	0.00	1,218.68
2016	1.32	9.97	6.38	0.01	4.75	0.45	5.20	1.95	0.45	2.40	0.00	1,316.36	1,316.36	0.11	0.00	1,318.61
2017	1.23	9.09	6.15	0.01	4.75	0.40	5.15	1.95	0.40	2.35	0.00	1,310.57	1,310.57	0.10	0.00	1,312.66
2018	1.16	8.33	6.00	0.01	4.75	0.36	5.11	1.95	0.36	2.31	0.00	1,314.92	1,314.92	0.09	0.00	1,316.90
2019	1.42	7.37	11.04	0.03	6.65	0.34	6.99	1.98	0.33	2.31	0.00	2,471.19	2,471.19	0.12	0.00	2,473.61
2020	1.59	6.63	14.50	0.04	3.55	0.32	3.87	0.06	0.30	0.36	0.00	3,413.48	3,413.48	0.13	0.00	3,416.18
2021	1.49	6.12	13.89	0.04	3.54	0.30	3.84	0.06	0.28	0.34	0.00	3,428.90	3,428.90	0.12	0.00	3,431.50
2022	1.40	5.68	13.12	0.04	3.52	0.28	3.80	0.06	0.26	0.32	0.00	3,381.94	3,381.94	0.12	0.00	3,384.38

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2023	1.33	5.32	12.47	0.04	3.52	0.26	3.79	0.06	0.25	0.31	0.00	3,351.39	3,351.39	0.11	0.00	3,353.69
2024	1.27	5.05	12.02	0.04	3.55	0.25	3.80	0.06	0.23	0.29	0.00	3,349.53	3,349.53	0.10	0.00	3,351.73
2025	1.21	4.76	11.51	0.04	3.54	0.24	3.77	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2026	1.21	4.76	11.51	0.04	3.54	0.24	3.77	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2027	1.21	4.76	11.51	0.04	3.54	0.24	3.77	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2028	1.21	4.74	11.47	0.04	3.52	0.24	3.76	0.06	0.22	0.28	0.00	3,299.68	3,299.68	0.10	0.00	3,301.76
2029	1.21	4.76	11.51	0.04	3.54	0.24	3.77	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2030	1.01	3.97	9.97	0.04	3.54	0.20	3.74	0.06	0.19	0.25	0.00	3,227.15	3,227.15	0.08	0.00	3,228.91
2031	1.01	3.97	9.97	0.04	3.54	0.20	3.74	0.06	0.19	0.25	0.00	3,227.15	3,227.15	0.08	0.00	3,228.91
2032	1.01	3.98	10.01	0.04	3.55	0.20	3.75	0.06	0.19	0.25	0.00	3,239.52	3,239.52	0.08	0.00	3,241.28
2033	1.00	3.95	9.93	0.04	3.52	0.20	3.72	0.06	0.19	0.25	0.00	3,214.79	3,214.79	0.08	0.00	3,216.54
2034	1.00	3.95	9.93	0.04	3.52	0.20	3.72	0.06	0.19	0.25	0.00	3,214.79	3,214.79	0.08	0.00	3,216.54
2035	0.89	3.65	9.12	0.04	3.54	0.19	3.73	0.06	0.18	0.23	0.00	3,184.18	3,184.18	0.07	0.00	3,185.74
2036	0.89	3.67	9.16	0.04	3.55	0.19	3.74	0.06	0.18	0.24	0.00	3,196.38	3,196.38	0.07	0.00	3,197.95
2037	0.89	3.65	9.12	0.04	3.54	0.19	3.73	0.06	0.18	0.23	0.00	3,184.18	3,184.18	0.07	0.00	3,185.74
2038	0.89	3.65	9.12	0.04	3.54	0.19	3.73	0.06	0.18	0.23	0.00	3,184.18	3,184.18	0.07	0.00	3,185.74
2039	0.88	3.64	9.09	0.04	3.52	0.19	3.71	0.06	0.17	0.23	0.00	3,171.98	3,171.98	0.07	0.00	3,173.54
2040	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2041	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2042	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2043	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2044	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2045	0.82	3.52	8.68	0.04	3.52	0.18	3.71	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2046	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2047	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2048	0.83	3.55	8.74	0.04	3.55	0.19	3.74	0.06	0.17	0.23	0.00	3,173.85	3,173.85	0.07	0.00	3,175.34
2049	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2050	0.82	3.52	8.68	0.04	3.52	0.18	3.71	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2051	0.82	3.52	8.68	0.04	3.52	0.18	3.71	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2052	0.83	3.55	8.74	0.04	3.55	0.19	3.74	0.06	0.17	0.23	0.00	3,173.85	3,173.85	0.07	0.00	3,175.34
2053	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2054	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2055	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2056	0.82	3.52	8.68	0.04	3.52	0.18	3.71	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2057	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2058	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2059	0.82	3.53	8.71	0.04	3.54	0.18	3.72	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2060	0.83	3.55	8.74	0.04	3.55	0.19	3.74	0.06	0.17	0.23	0.00	3,173.85	3,173.85	0.07	0.00	3,175.34
2061	0.21	1.20	2.76	0.01	0.17	0.03	0.20	0.00	0.03	0.03	0.00	470.23	470.23	0.02	0.00	470.60
2062	0.19	1.11	2.52	0.00	0.03	0.02	0.06	0.00	0.02	0.02	0.00	363.06	363.06	0.02	0.00	363.38
2063	0.23	1.11	2.53	0.00	0.04	0.02	0.06	0.00	0.02	0.02	0.00	364.59	364.59	0.02	0.00	364.92
2064	10.58	0.16	1.10	0.01	0.66	0.02	0.68	0.01	0.02	0.03	0.00	402.19	402.19	0.01	0.00	402.41

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2065	10.54	0.16	1.10	0.01	0.65	0.02	0.68	0.01	0.02	0.03	0.00	400.66	400.66	0.01	0.00	400.87
2066	9.94	0.15	1.03	0.01	0.62	0.02	0.64	0.01	0.02	0.03	0.00	377.63	377.63	0.01	0.00	377.84
Total	**83.00**	**253.48**	**472.63**	**1.79**	**184.34**	**12.51**	**196.90**	**18.54**	**11.96**	**30.45**	**0.00**	**145,648.52**	**145,648.52**	**4.33**	**0.00**	**145,740.06**

2.1 Overall Construction

<u>Mitigated Construction</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.00	0.53	0.54	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	1.24	9.83	5.99	0.01	0.00	0.50	0.50	0.00	0.50	0.50	0.00	915.00	915.00	0.10	0.00	917.11
2013	1.22	9.63	5.88	0.01	3.80	0.48	4.27	2.09	0.48	2.56	0.00	934.08	934.08	0.10	0.00	936.17
2014	1.24	9.79	5.83	0.01	3.80	0.47	4.27	2.09	0.47	2.56	0.00	976.36	976.36	0.10	0.00	978.48
2015	1.33	10.36	6.29	0.01	8.50	0.48	8.98	4.04	0.48	4.51	0.00	1,216.42	1,216.42	0.11	0.00	1,218.68
2016	1.32	9.97	6.38	0.01	4.71	0.45	5.16	1.95	0.45	2.40	0.00	1,316.36	1,316.36	0.11	0.00	1,318.61
2017	1.23	9.09	6.15	0.01	4.71	0.40	5.11	1.95	0.40	2.35	0.00	1,310.57	1,310.57	0.10	0.00	1,312.66
2018	1.16	8.33	6.00	0.01	4.71	0.36	5.07	1.95	0.36	2.31	0.00	1,314.92	1,314.92	0.09	0.00	1,316.90
2019	1.42	7.37	11.04	0.03	4.80	0.34	5.13	1.98	0.33	2.31	0.00	2,471.19	2,471.19	0.12	0.00	2,473.61
2020	1.59	6.63	14.50	0.04	0.17	0.32	0.49	0.06	0.30	0.36	0.00	3,413.48	3,413.48	0.13	0.00	3,416.18
2021	1.49	6.12	13.89	0.04	0.17	0.30	0.47	0.06	0.28	0.34	0.00	3,428.90	3,428.90	0.12	0.00	3,431.50

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	1.40	5.68	13.12	0.04	0.17	0.28	0.44	0.06	0.26	0.32	0.00	3,381.94	3,381.94	0.12	0.00	3,384.38
2023	1.33	5.32	12.47	0.04	0.17	0.26	0.43	0.06	0.25	0.31	0.00	3,351.39	3,351.39	0.11	0.00	3,353.69
2024	1.27	5.05	12.02	0.04	0.17	0.25	0.42	0.06	0.23	0.29	0.00	3,349.53	3,349.53	0.10	0.00	3,351.73
2025	1.21	4.76	11.51	0.04	0.17	0.24	0.40	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2026	1.21	4.76	11.51	0.04	0.17	0.24	0.40	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2027	1.21	4.76	11.51	0.04	0.17	0.24	0.40	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2028	1.21	4.74	11.47	0.04	0.17	0.24	0.40	0.06	0.22	0.28	0.00	3,299.68	3,299.68	0.10	0.00	3,301.76
2029	1.21	4.76	11.51	0.04	0.17	0.24	0.40	0.06	0.22	0.28	0.00	3,312.37	3,312.37	0.10	0.00	3,314.46
2030	1.01	3.97	9.97	0.04	0.17	0.20	0.37	0.06	0.19	0.25	0.00	3,227.15	3,227.15	0.08	0.00	3,228.91
2031	1.01	3.97	9.97	0.04	0.17	0.20	0.37	0.06	0.19	0.25	0.00	3,227.15	3,227.15	0.08	0.00	3,228.91
2032	1.01	3.98	10.01	0.04	0.17	0.20	0.37	0.06	0.19	0.25	0.00	3,239.52	3,239.52	0.08	0.00	3,241.28
2033	1.00	3.95	9.93	0.04	0.17	0.20	0.37	0.06	0.19	0.25	0.00	3,214.79	3,214.79	0.08	0.00	3,216.54
2034	1.00	3.95	9.93	0.04	0.17	0.20	0.37	0.06	0.19	0.25	0.00	3,214.79	3,214.79	0.08	0.00	3,216.54
2035	0.89	3.65	9.12	0.04	0.17	0.19	0.35	0.06	0.18	0.23	0.00	3,184.18	3,184.18	0.07	0.00	3,185.74
2036	0.89	3.67	9.16	0.04	0.17	0.19	0.36	0.06	0.18	0.24	0.00	3,196.38	3,196.38	0.07	0.00	3,197.95
2037	0.89	3.65	9.12	0.04	0.17	0.19	0.35	0.06	0.18	0.23	0.00	3,184.18	3,184.18	0.07	0.00	3,185.74
2038	0.89	3.65	9.12	0.04	0.17	0.19	0.35	0.06	0.18	0.23	0.00	3,184.18	3,184.18	0.07	0.00	3,185.74
2039	0.88	3.64	9.09	0.04	0.17	0.19	0.35	0.06	0.17	0.23	0.00	3,171.98	3,171.98	0.07	0.00	3,173.54
2040	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2041	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2042	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2043	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2044	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2045	0.82	3.52	8.68	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2046	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2047	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2048	0.83	3.55	8.74	0.04	0.17	0.19	0.35	0.06	0.17	0.23	0.00	3,173.85	3,173.85	0.07	0.00	3,175.34
2049	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2050	0.82	3.52	8.68	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2051	0.82	3.52	8.68	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2052	0.83	3.55	8.74	0.04	0.17	0.19	0.35	0.06	0.17	0.23	0.00	3,173.85	3,173.85	0.07	0.00	3,175.34
2053	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2054	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2055	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2056	0.82	3.52	8.68	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,149.63	3,149.63	0.07	0.00	3,151.10
2057	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2058	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2059	0.82	3.53	8.71	0.04	0.17	0.18	0.35	0.06	0.17	0.23	0.00	3,161.74	3,161.74	0.07	0.00	3,163.22
2060	0.83	3.55	8.74	0.04	0.17	0.19	0.35	0.06	0.17	0.23	0.00	3,173.85	3,173.85	0.07	0.00	3,175.34
2061	0.21	1.20	2.76	0.01	0.01	0.03	0.04	0.00	0.03	0.03	0.00	470.23	470.23	0.02	0.00	470.60
2062	0.19	1.11	2.52	0.00	0.00	0.02	0.03	0.00	0.02	0.02	0.00	363.06	363.06	0.02	0.00	363.38
2063	0.23	1.11	2.53	0.00	0.00	0.02	0.03	0.00	0.02	0.02	0.00	364.59	364.59	0.02	0.00	364.92

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2064	10.58	0.16	1.10	0.01	0.03	0.02	0.05	0.01	0.02	0.03	0.00	402.19	402.19	0.01	0.00	402.41
2065	10.54	0.16	1.10	0.01	0.03	0.02	0.05	0.01	0.02	0.03	0.00	400.66	400.66	0.01	0.00	400.87
2066	9.94	0.15	1.03	0.01	0.03	0.02	0.05	0.01	0.02	0.03	0.00	377.63	377.63	0.01	0.00	377.84
Total	**83.00**	**253.48**	**472.63**	**1.79**	**42.10**	**12.51**	**54.49**	**18.54**	**11.96**	**30.45**	**0.00**	**145,648.52**	**145,648.52**	**4.33**	**0.00**	**145,740.06**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	16.95	0.20	17.85	0.00		0.00	0.31		0.00	0.31	0.00	3,120.98	3,120.98	0.09	0.06	3,140.39
Energy	0.31	2.62	1.15	0.02		0.00	0.21		0.00	0.21	0.00	6,830.52	6,830.52	0.23	0.12	6,872.77
Mobile	18.56	84.55	149.15	0.46	40.96	2.71	43.67	0.76	2.47	3.23	0.00	41,271.94	41,271.94	1.05	0.00	41,294.02
Waste						0.00	0.00		0.00	0.00	455.32	0.00	455.32	26.91	0.00	1,020.40
Water						0.00	0.00		0.00	0.00	0.00	721.43	721.43	4.91	0.13	865.94
Total	**35.82**	**87.37**	**168.15**	**0.48**	**40.96**	**2.71**	**44.19**	**0.76**	**2.47**	**3.75**	**455.32**	**51,944.87**	**52,400.19**	**33.19**	**0.31**	**53,193.52**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	16.94	0.20	17.81	0.00		0.00	0.31		0.00	0.31	0.00	3,120.90	3,120.90	0.09	0.06	3,140.30
Energy	0.31	2.62	1.15	0.02		0.00	0.21		0.00	0.21	0.00	6,830.52	6,830.52	0.23	0.12	6,872.77
Mobile	18.56	84.55	149.15	0.46	40.96	2.71	43.67	0.76	2.47	3.23	0.00	41,271.94	41,271.94	1.05	0.00	41,294.02
Waste						0.00	0.00		0.00	0.00	455.32	0.00	455.32	26.91	0.00	1,020.40
Water						0.00	0.00		0.00	0.00	0.00	721.43	721.43	4.91	0.13	865.94
Total	**35.81**	**87.37**	**168.11**	**0.48**	**40.96**	**2.71**	**44.19**	**0.76**	**2.47**	**3.75**	**455.32**	**51,944.79**	**52,400.11**	**33.19**	**0.31**	**53,193.43**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.7 Architectural Coating - 2066

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	9.84					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.09	0.22	0.00		0.00	0.00		0.00	0.00	0.00	31.37	31.37	0.00	0.00	31.39
Total	**9.85**	**0.09**	**0.22**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**31.37**	**31.37**	**0.00**	**0.00**	**31.39**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.08	0.06	0.81	0.01	0.03	0.02	0.05	0.01	0.02	0.03	0.00	346.26	346.26	0.01	0.00	346.44
Total	**0.08**	**0.06**	**0.81**	**0.01**	**0.03**	**0.02**	**0.05**	**0.01**	**0.02**	**0.03**	**0.00**	**346.26**	**346.26**	**0.01**	**0.00**	**346.44**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	18.56	84.55	149.15	0.46	40.96	2.71	43.67	0.76	2.47	3.23	0.00	41,271.94	41,271.94	1.05	0.00	41,294.02
Unmitigated	18.56	84.55	149.15	0.46	40.96	2.71	43.67	0.76	2.47	3.23	0.00	41,271.94	41,271.94	1.05	0.00	41,294.02
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	5,818.97	6,322.28	5359.81	22,224,303	22,224,303
Apartments Mid Rise	3,492.70	3,794.80	3217.10	13,339,616	13,339,616
City Park	230.03	230.03	230.03	567,290	567,290
Elementary School	1,419.56	0.00	0.00	3,037,025	3,037,025
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	9,244.62	9,737.28	8471.82	35,116,925	35,116,925
User Defined Commercial	55.20	55.20	55.20	122,667	122,667
Total	22,392.95	21,325.64	18,616.91	78,817,048	78,817,048

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	3,805.25	3,805.25	0.17	0.07	3,829.10
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	3,805.25	3,805.25	0.17	0.07	3,829.10
NaturalGas Mitigated	0.31	2.62	1.15	0.02		0.00	0.21		0.00	0.21	0.00	3,025.27	3,025.27	0.06	0.06	3,043.68
NaturalGas Unmitigated	0.31	2.62	1.15	0.02		0.00	0.21		0.00	0.21	0.00	3,025.27	3,025.27	0.06	0.06	3,043.68
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.26339e+007	0.07	0.58	0.25	0.00		0.00	0.05		0.00	0.05	0.00	674.19	674.19	0.01	0.01	678.30
Apartments Mid Rise	7.09888e+006	0.04	0.33	0.14	0.00		0.00	0.03		0.00	0.03	0.00	378.82	378.82	0.01	0.01	381.13
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	3.51138e+007	0.19	1.62	0.69	0.01		0.00	0.13		0.00	0.13	0.00	1,873.80	1,873.80	0.04	0.03	1,885.21
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.30**	**2.61**	**1.16**	**0.01**		**0.00**	**0.21**		**0.00**	**0.21**	**0.00**	**3,025.26**	**3,025.26**	**0.06**	**0.05**	**3,043.68**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.26339e+007	0.07	0.58	0.25	0.00		0.00	0.05		0.00	0.05	0.00	674.19	674.19	0.01	0.01	678.30
Apartments Mid Rise	7.09888e+006	0.04	0.33	0.14	0.00		0.00	0.03		0.00	0.03	0.00	378.82	378.82	0.01	0.01	381.13
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	914480	0.00	0.04	0.04	0.00		0.00	0.00		0.00	0.00	0.00	48.80	48.80	0.00	0.00	49.10
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	3.51138e+007	0.19	1.62	0.69	0.01		0.00	0.13		0.00	0.13	0.00	1,873.80	1,873.80	0.04	0.03	1,885.21
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.30**	**2.61**	**1.16**	**0.01**		**0.00**	**0.21**		**0.00**	**0.21**	**0.00**	**3,025.26**	**3,025.26**	**0.06**	**0.05**	**3,043.68**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.37778e+006					982.64	0.04	0.02	988.79
Apartments Mid Rise	1.94116e+006					564.70	0.03	0.01	568.24
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	6.62153e+006					1,926.28	0.09	0.03	1,938.35
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**3,805.25**	**0.18**	**0.06**	**3,829.09**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.37778e+006					982.64	0.04	0.02	988.79
Apartments Mid Rise	1.94116e+006					564.70	0.03	0.01	568.24
City Park	0					0.00	0.00	0.00	0.00
Elementary School	590640					171.82	0.01	0.00	172.90
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	6.62153e+006					1,926.28	0.09	0.03	1,938.35
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**3,805.25**	**0.18**	**0.06**	**3,829.09**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	16.94	0.20	17.81	0.00		0.00	0.31		0.00	0.31	0.00	3,120.90	3,120.90	0.09	0.06	3,140.30
Unmitigated	16.95	0.20	17.85	0.00		0.00	0.31		0.00	0.31	0.00	3,120.98	3,120.98	0.09	0.06	3,140.39
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.08					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	13.02					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.31	0.00	0.02	0.00		0.00	0.22		0.00	0.21	0.00	3,091.80	3,091.80	0.06	0.06	3,110.62
Landscaping	0.54	0.20	17.84	0.00		0.00	0.10		0.00	0.10	0.00	29.18	29.18	0.03	0.00	29.77
Total	**16.95**	**0.20**	**17.86**	**0.00**		**0.00**	**0.32**		**0.00**	**0.31**	**0.00**	**3,120.98**	**3,120.98**	**0.09**	**0.06**	**3,140.39**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.08					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	13.02					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.31	0.00	0.02	0.00		0.00	0.22		0.00	0.21	0.00	3,091.80	3,091.80	0.06	0.06	3,110.62
Landscaping	0.53	0.20	17.80	0.00		0.00	0.10		0.00	0.10	0.00	29.10	29.10	0.03	0.00	29.68
Total	**16.94**	**0.20**	**17.82**	**0.00**		**0.00**	**0.32**		**0.00**	**0.31**	**0.00**	**3,120.90**	**3,120.90**	**0.09**	**0.06**	**3,140.30**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					721.43	4.91	0.13	865.94
Unmitigated					721.43	4.91	0.13	865.94
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	57.531 / 36.2695					128.14	1.76	0.05	179.31
Apartments Mid Rise	34.5316 / 21.7699					76.91	1.06	0.03	107.63
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	62.9388 / 39.6788					140.18	1.93	0.05	196.17
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**721.43**	**4.92**	**0.13**	**865.94**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	57.531 / 36.2695					128.14	1.76	0.05	179.31
Apartments Mid Rise	34.5316 / 21.7699					76.91	1.06	0.03	107.63
City Park	0 / 172.372					175.51	0.01	0.00	176.61
Elementary School	2.66772 / 6.85984					11.21	0.08	0.00	13.62
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	62.9388 / 39.6788					140.18	1.93	0.05	196.17
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**721.43**	**4.92**	**0.13**	**865.94**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					455.32	26.91	0.00	1,020.40
Unmitigated					455.32	26.91	0.00	1,020.40
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	406.18					82.45	4.87	0.00	184.78
Apartments Mid Rise	243.8					49.49	2.92	0.00	110.91
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	1152.83					234.01	13.83	0.00	524.44
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**455.33**	**26.90**	**0.00**	**1,020.41**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	406.18					82.45	4.87	0.00	184.78
Apartments Mid Rise	243.8					49.49	2.92	0.00	110.91
City Park	12.44					2.53	0.15	0.00	5.66
Elementary School	119.6					24.28	1.43	0.00	54.41
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	1152.83					234.01	13.83	0.00	524.44
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**455.33**	**26.90**	**0.00**	**1,020.41**

9.0 Vegetation

River Islands Operation - Proposed Project 2028

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	10	User Defined Unit
Elementary School	138	1000sqft
Junior High School	64	1000sqft
City Park	180.83	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	970	Dwelling Unit
Apartments Mid Rise	680	Dwelling Unit
Single Family Housing	1391	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Wind Speed (m/s) 2.7

Utility Company Pacific Gas & Electric Company

Climate Zone 2

Precipitation Freq (Days) 45

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.03	0.53	0.57	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	1.24	9.83	5.99	0.01	0.03	0.50	0.53	0.00	0.50	0.50	0.00	915.00	915.00	0.10	0.00	917.11
2013	1.17	9.25	5.75	0.01	0.03	0.46	0.49	0.00	0.46	0.46	0.00	914.38	914.38	0.10	0.00	916.39
2014	1.18	9.28	5.69	0.01	4.92	0.45	5.36	2.68	0.45	3.13	0.00	948.06	948.06	0.10	0.00	950.08
2015	1.17	9.12	5.53	0.01	4.92	0.43	5.35	2.68	0.43	3.11	0.00	975.60	975.60	0.10	0.00	977.60
2016	1.21	9.20	5.80	0.01	10.97	0.42	11.39	5.19	0.42	5.61	0.00	1,138.41	1,138.41	0.10	0.00	1,140.47
2017	1.23	9.09	6.15	0.01	6.09	0.40	6.50	2.51	0.40	2.91	0.00	1,310.57	1,310.57	0.10	0.00	1,312.66
2018	1.16	8.33	6.00	0.01	6.10	0.36	6.46	2.51	0.36	2.87	0.00	1,314.92	1,314.92	0.09	0.00	1,316.90
2019	1.09	7.60	5.84	0.01	6.10	0.33	6.42	2.51	0.32	2.83	0.00	1,314.30	1,314.30	0.09	0.00	1,316.16
2020	1.03	6.95	5.73	0.01	6.10	0.29	6.39	2.51	0.29	2.80	0.00	1,318.78	1,318.78	0.08	0.00	1,320.54
2021	1.08	6.43	7.07	0.02	6.68	0.27	6.95	2.52	0.27	2.79	0.00	1,696.13	1,696.13	0.09	0.00	1,697.97
2022	1.67	6.69	15.63	0.05	4.37	0.33	4.70	0.07	0.31	0.38	0.00	4,104.82	4,104.82	0.14	0.00	4,107.71

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2023	1.59	6.28	14.83	0.05	4.37	0.31	4.68	0.07	0.29	0.37	0.00	4,066.97	4,066.97	0.13	0.00	4,069.72
2024	1.52	5.97	14.26	0.05	4.41	0.30	4.70	0.07	0.28	0.35	0.00	4,064.04	4,064.04	0.12	0.00	4,066.66
2025	1.45	5.65	13.64	0.05	4.39	0.28	4.67	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82
2026	1.45	5.65	13.64	0.05	4.39	0.28	4.67	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82
2027	1.45	5.65	13.64	0.05	4.39	0.28	4.67	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82
2028	1.44	5.63	13.58	0.05	4.37	0.28	4.66	0.07	0.26	0.34	0.00	4,002.94	4,002.94	0.12	0.00	4,005.42
2029	1.45	5.65	13.64	0.05	4.39	0.28	4.67	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82
2030	1.20	4.75	11.73	0.05	4.39	0.24	4.64	0.07	0.23	0.30	0.00	3,912.80	3,912.80	0.10	0.00	3,914.90
2031	1.20	4.75	11.73	0.05	4.39	0.24	4.64	0.07	0.23	0.30	0.00	3,912.80	3,912.80	0.10	0.00	3,914.90
2032	1.21	4.77	11.77	0.05	4.41	0.25	4.65	0.07	0.23	0.30	0.00	3,927.80	3,927.80	0.10	0.00	3,929.90
2033	1.20	4.74	11.68	0.05	4.37	0.24	4.62	0.07	0.23	0.30	0.00	3,897.81	3,897.81	0.10	0.00	3,899.90
2034	1.20	4.74	11.68	0.05	4.37	0.24	4.62	0.07	0.23	0.30	0.00	3,897.81	3,897.81	0.10	0.00	3,899.90
2035	1.06	4.39	10.68	0.05	4.39	0.23	4.62	0.07	0.22	0.29	0.00	3,859.59	3,859.59	0.09	0.00	3,861.45
2036	1.06	4.41	10.72	0.05	4.41	0.23	4.64	0.07	0.22	0.29	0.00	3,874.38	3,874.38	0.09	0.00	3,876.25
2037	1.06	4.39	10.68	0.05	4.39	0.23	4.62	0.07	0.22	0.29	0.00	3,859.59	3,859.59	0.09	0.00	3,861.45
2038	1.06	4.39	10.68	0.05	4.39	0.23	4.62	0.07	0.22	0.29	0.00	3,859.59	3,859.59	0.09	0.00	3,861.45
2039	1.05	4.38	10.64	0.05	4.37	0.23	4.60	0.07	0.21	0.29	0.00	3,844.80	3,844.80	0.09	0.00	3,846.66
2040	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2041	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2042	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2043	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2044	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2045	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2046	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2047	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2048	0.98	4.27	10.20	0.05	4.41	0.23	4.64	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25
2049	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2050	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2051	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2052	0.98	4.27	10.20	0.05	4.41	0.23	4.64	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25
2053	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2054	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2055	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2056	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2057	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2058	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2059	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2060	0.98	4.27	10.20	0.05	4.41	0.23	4.64	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25
2061	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2062	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2063	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2064	0.98	4.27	10.20	0.05	4.41	0.23	4.64	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2065	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2066	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2067	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2068	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2069	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2070	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2071	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2072	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2073	0.98	4.24	10.13	0.05	4.37	0.23	4.60	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2074	0.98	4.26	10.16	0.05	4.39	0.23	4.62	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2075	0.46	2.18	5.13	0.02	1.52	0.09	1.61	0.03	0.09	0.11	0.00	1,546.80	1,546.80	0.04	0.00	1,547.62
2076	0.19	1.11	2.54	0.00	0.03	0.02	0.06	0.00	0.02	0.03	0.00	365.85	365.85	0.02	0.00	366.18
2077	0.19	1.11	2.53	0.00	0.03	0.02	0.06	0.00	0.02	0.02	0.00	364.45	364.45	0.02	0.00	364.78
2078	0.19	1.11	2.52	0.00	0.03	0.02	0.06	0.00	0.02	0.02	0.00	363.06	363.06	0.02	0.00	363.38
2079	9.34	0.30	1.46	0.01	0.70	0.03	0.73	0.01	0.03	0.04	0.00	470.14	470.14	0.01	0.00	470.41
2080	10.85	0.17	1.31	0.01	0.81	0.03	0.84	0.01	0.03	0.04	0.00	490.55	490.55	0.01	0.00	490.81
2081	10.80	0.17	1.30	0.01	0.81	0.03	0.84	0.01	0.03	0.04	0.00	488.67	488.67	0.01	0.00	488.94
2082	10.02	0.16	1.21	0.01	0.75	0.03	0.78	0.01	0.03	0.04	0.00	453.10	453.10	0.01	0.00	453.34
Total	**112.52**	**343.66**	**664.14**	**2.83**	**289.18**	**17.46**	**306.70**	**26.89**	**16.51**	**43.47**	**0.00**	**222,514.28**	**222,514.28**	**5.94**	**0.00**	**222,641.08**

2.1 Overall Construction

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	1.30	10.41	6.22	0.01	0.00	0.53	0.54	0.00	0.53	0.53	0.00	912.13	912.13	0.11	0.00	914.35
2012	1.24	9.83	5.99	0.01	0.00	0.50	0.50	0.00	0.50	0.50	0.00	915.00	915.00	0.10	0.00	917.11
2013	1.17	9.25	5.75	0.01	0.00	0.46	0.46	0.00	0.46	0.46	0.00	914.38	914.38	0.10	0.00	916.39
2014	1.18	9.28	5.69	0.01	4.88	0.45	5.33	2.68	0.45	3.13	0.00	948.06	948.06	0.10	0.00	950.08
2015	1.17	9.12	5.53	0.01	4.88	0.43	5.31	2.68	0.43	3.11	0.00	975.60	975.60	0.10	0.00	977.60
2016	1.21	9.20	5.80	0.01	10.93	0.42	11.35	5.19	0.42	5.61	0.00	1,138.41	1,138.41	0.10	0.00	1,140.47
2017	1.23	9.09	6.15	0.01	6.05	0.40	6.45	2.51	0.40	2.91	0.00	1,310.57	1,310.57	0.10	0.00	1,312.66
2018	1.16	8.33	6.00	0.01	6.05	0.36	6.41	2.51	0.36	2.87	0.00	1,314.92	1,314.92	0.09	0.00	1,316.90
2019	1.09	7.60	5.84	0.01	6.05	0.33	6.38	2.51	0.32	2.83	0.00	1,314.30	1,314.30	0.09	0.00	1,316.16
2020	1.03	6.95	5.73	0.01	6.05	0.29	6.34	2.51	0.29	2.80	0.00	1,318.78	1,318.78	0.08	0.00	1,320.54
2021	1.08	6.43	7.07	0.02	6.08	0.27	6.35	2.52	0.27	2.79	0.00	1,696.13	1,696.13	0.09	0.00	1,697.97
2022	1.67	6.69	15.63	0.05	0.21	0.33	0.53	0.07	0.31	0.38	0.00	4,104.82	4,104.82	0.14	0.00	4,107.71
2023	1.59	6.28	14.83	0.05	0.21	0.31	0.51	0.07	0.29	0.37	0.00	4,066.97	4,066.97	0.13	0.00	4,069.72
2024	1.52	5.97	14.26	0.05	0.21	0.30	0.50	0.07	0.28	0.35	0.00	4,064.04	4,064.04	0.12	0.00	4,066.66
2025	1.45	5.65	13.64	0.05	0.21	0.28	0.49	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82
2026	1.45	5.65	13.64	0.05	0.21	0.28	0.49	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82
2027	1.45	5.65	13.64	0.05	0.21	0.28	0.49	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82
2028	1.44	5.63	13.58	0.05	0.21	0.28	0.49	0.07	0.26	0.34	0.00	4,002.94	4,002.94	0.12	0.00	4,005.42
2029	1.45	5.65	13.64	0.05	0.21	0.28	0.49	0.07	0.27	0.34	0.00	4,018.34	4,018.34	0.12	0.00	4,020.82

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2030	1.20	4.75	11.73	0.05	0.21	0.24	0.45	0.07	0.23	0.30	0.00	3,912.80	3,912.80	0.10	0.00	3,914.90
2031	1.20	4.75	11.73	0.05	0.21	0.24	0.45	0.07	0.23	0.30	0.00	3,912.80	3,912.80	0.10	0.00	3,914.90
2032	1.21	4.77	11.77	0.05	0.21	0.25	0.45	0.07	0.23	0.30	0.00	3,927.80	3,927.80	0.10	0.00	3,929.90
2033	1.20	4.74	11.68	0.05	0.21	0.24	0.45	0.07	0.23	0.30	0.00	3,897.81	3,897.81	0.10	0.00	3,899.90
2034	1.20	4.74	11.68	0.05	0.21	0.24	0.45	0.07	0.23	0.30	0.00	3,897.81	3,897.81	0.10	0.00	3,899.90
2035	1.06	4.39	10.68	0.05	0.21	0.23	0.44	0.07	0.22	0.29	0.00	3,859.59	3,859.59	0.09	0.00	3,861.45
2036	1.06	4.41	10.72	0.05	0.21	0.23	0.44	0.07	0.22	0.29	0.00	3,874.38	3,874.38	0.09	0.00	3,876.25
2037	1.06	4.39	10.68	0.05	0.21	0.23	0.44	0.07	0.22	0.29	0.00	3,859.59	3,859.59	0.09	0.00	3,861.45
2038	1.06	4.39	10.68	0.05	0.21	0.23	0.44	0.07	0.22	0.29	0.00	3,859.59	3,859.59	0.09	0.00	3,861.45
2039	1.05	4.38	10.64	0.05	0.21	0.23	0.44	0.07	0.21	0.29	0.00	3,844.80	3,844.80	0.09	0.00	3,846.66
2040	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2041	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2042	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2043	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2044	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2045	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2046	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2047	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2048	0.98	4.27	10.20	0.05	0.21	0.23	0.44	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25
2049	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2050	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2051	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2052	0.98	4.27	10.20	0.05	0.21	0.23	0.44	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25
2053	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2054	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2055	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2056	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2057	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2058	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2059	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2060	0.98	4.27	10.20	0.05	0.21	0.23	0.44	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25
2061	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2062	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2063	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2064	0.98	4.27	10.20	0.05	0.21	0.23	0.44	0.07	0.21	0.29	0.00	3,846.48	3,846.48	0.08	0.00	3,848.25
2065	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2066	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2067	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2068	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2069	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2070	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2071	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2072	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2073	0.98	4.24	10.13	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,817.12	3,817.12	0.08	0.00	3,818.87
2074	0.98	4.26	10.16	0.05	0.21	0.23	0.43	0.07	0.21	0.28	0.00	3,831.80	3,831.80	0.08	0.00	3,833.56
2075	0.46	2.18	5.13	0.02	0.07	0.09	0.17	0.03	0.09	0.11	0.00	1,546.80	1,546.80	0.04	0.00	1,547.62
2076	0.19	1.11	2.54	0.00	0.00	0.02	0.03	0.00	0.02	0.03	0.00	365.85	365.85	0.02	0.00	366.18
2077	0.19	1.11	2.53	0.00	0.00	0.02	0.03	0.00	0.02	0.02	0.00	364.45	364.45	0.02	0.00	364.78
2078	0.19	1.11	2.52	0.00	0.00	0.02	0.03	0.00	0.02	0.02	0.00	363.06	363.06	0.02	0.00	363.38
2079	9.34	0.30	1.46	0.01	0.03	0.03	0.06	0.01	0.03	0.04	0.00	470.14	470.14	0.01	0.00	470.41
2080	10.85	0.17	1.31	0.01	0.04	0.03	0.07	0.01	0.03	0.04	0.00	490.55	490.55	0.01	0.00	490.81
2081	10.80	0.17	1.30	0.01	0.04	0.03	0.07	0.01	0.03	0.04	0.00	488.67	488.67	0.01	0.00	488.94
2082	10.02	0.16	1.21	0.01	0.03	0.03	0.06	0.01	0.03	0.04	0.00	453.10	453.10	0.01	0.00	453.34
Total	**112.52**	**343.66**	**664.14**	**2.83**	**62.31**	**17.46**	**79.47**	**26.89**	**16.51**	**43.47**	**0.00**	**222,514.28**	**222,514.28**	**5.94**	**0.00**	**222,641.08**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	30.05	1.42	93.67	0.23		0.00	11.96		0.00	11.96	1,547.47	3,989.45	5,536.93	7.35	0.07	5,713.64
Energy	0.41	3.50	1.54	0.02		0.00	0.28		0.00	0.28	0.00	9,042.99	9,042.99	0.30	0.16	9,098.93
Mobile	23.91	108.82	192.25	0.60	52.89	3.50	56.39	0.99	3.19	4.17	0.00	53,272.56	53,272.56	1.36	0.00	53,301.03
Waste						0.00	0.00		0.00	0.00	593.17	0.00	593.17	35.06	0.00	1,329.34
Water						0.00	0.00		0.00	0.00	0.00	866.97	866.97	6.28	0.17	1,051.32
Total	**54.37**	**113.74**	**287.46**	**0.85**	**52.89**	**3.50**	**68.63**	**0.99**	**3.19**	**16.41**	**2,140.64**	**67,171.97**	**69,312.62**	**50.35**	**0.40**	**70,494.26**

2.2 Overall Operational

<u>Mitigated Operational</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	22.24	0.26	22.77	0.00		0.00	0.40		0.00	0.40	0.00	3,989.34	3,989.34	0.11	0.07	4,014.14
Energy	0.41	3.50	1.54	0.02		0.00	0.28		0.00	0.28	0.00	9,042.99	9,042.99	0.30	0.16	9,098.93
Mobile	23.91	108.82	192.25	0.60	52.89	3.50	56.39	0.99	3.19	4.17	0.00	53,272.56	53,272.56	1.36	0.00	53,301.03
Waste						0.00	0.00		0.00	0.00	593.17	0.00	593.17	35.06	0.00	1,329.34
Water						0.00	0.00		0.00	0.00	0.00	866.97	866.97	6.28	0.17	1,051.32
Total	**46.56**	**112.58**	**216.56**	**0.62**	**52.89**	**3.50**	**57.07**	**0.99**	**3.19**	**4.85**	**593.17**	**67,171.86**	**67,765.03**	**43.11**	**0.40**	**68,794.76**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.7 Architectural Coating - 2082

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	9.91					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.09	0.22	0.00		0.00	0.00		0.00	0.00	0.00	30.86	30.86	0.00	0.00	30.88
Total	**9.92**	**0.09**	**0.22**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**30.86**	**30.86**	**0.00**	**0.00**	**30.88**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.10	0.07	0.99	0.01	0.03	0.03	0.06	0.01	0.03	0.04	0.00	422.24	422.24	0.01	0.00	422.46
Total	**0.10**	**0.07**	**0.99**	**0.01**	**0.03**	**0.03**	**0.06**	**0.01**	**0.03**	**0.04**	**0.00**	**422.24**	**422.24**	**0.01**	**0.00**	**422.46**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	23.91	108.82	192.25	0.60	52.89	3.50	56.39	0.99	3.19	4.17	0.00	53,272.56	53,272.56	1.36	0.00	53,301.03
Unmitigated	23.91	108.82	192.25	0.60	52.89	3.50	56.39	0.99	3.19	4.17	0.00	53,272.56	53,272.56	1.36	0.00	53,301.03
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	6,392.30	6,945.20	5887.90	24,414,014	24,414,014
Apartments Mid Rise	4,481.20	4,868.80	4127.60	17,114,979	17,114,979
City Park	287.52	287.52	287.52	709,083	709,083
Elementary School	2,129.34	0.00	0.00	4,555,538	4,555,538
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	13,311.87	14,021.28	12199.07	50,566,918	50,566,918
User Defined Commercial	0.00	0.00	0.00		
Total	28,734.10	27,308.85	23,785.04	101,769,753	101,769,753

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
User Defined Commercial	14.70	6.60	6.60	0.00	0.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	4,995.29	4,995.29	0.23	0.09	5,026.59
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	4,995.29	4,995.29	0.23	0.09	5,026.59
NaturalGas Mitigated	0.41	3.50	1.54	0.02		0.00	0.28		0.00	0.28	0.00	4,047.70	4,047.70	0.08	0.07	4,072.34
NaturalGas Unmitigated	0.41	3.50	1.54	0.02		0.00	0.28		0.00	0.28	0.00	4,047.70	4,047.70	0.08	0.07	4,072.34
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.38787e+007	0.07	0.64	0.27	0.00		0.00	0.05		0.00	0.05	0.00	740.62	740.62	0.01	0.01	745.13
Apartments Mid Rise	9.108e+006	0.05	0.42	0.18	0.00		0.00	0.03		0.00	0.03	0.00	486.04	486.04	0.01	0.01	489.00
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	5.05624e+007	0.27	2.33	0.99	0.01		0.00	0.19		0.00	0.19	0.00	2,698.20	2,698.20	0.05	0.05	2,714.62
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.40**	**3.50**	**1.54**	**0.01**		**0.00**	**0.28**		**0.00**	**0.28**	**0.00**	**4,047.71**	**4,047.71**	**0.07**	**0.07**	**4,072.34**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.38787e+007	0.07	0.64	0.27	0.00		0.00	0.05		0.00	0.05	0.00	740.62	740.62	0.01	0.01	745.13
Apartments Mid Rise	9.108e+006	0.05	0.42	0.18	0.00		0.00	0.03		0.00	0.03	0.00	486.04	486.04	0.01	0.01	489.00
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	5.05624e+007	0.27	2.33	0.99	0.01		0.00	0.19		0.00	0.19	0.00	2,698.20	2,698.20	0.05	0.05	2,714.62
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.40**	**3.50**	**1.54**	**0.01**		**0.00**	**0.28**		**0.00**	**0.28**	**0.00**	**4,047.71**	**4,047.71**	**0.07**	**0.07**	**4,072.34**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.71059e+006					1,079.45	0.05	0.02	1,086.22
Apartments Mid Rise	2.49054e+006					724.53	0.03	0.01	729.07
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	9.53473e+006					2,773.76	0.13	0.05	2,791.15
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**4,995.29**	**0.23**	**0.08**	**5,026.60**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	3.71059e+006					1,079.45	0.05	0.02	1,086.22
Apartments Mid Rise	2.49054e+006					724.53	0.03	0.01	729.07
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	9.53473e+006					2,773.76	0.13	0.05	2,791.15
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**4,995.29**	**0.23**	**0.08**	**5,026.60**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	22.24	0.26	22.77	0.00		0.00	0.40		0.00	0.40	0.00	3,989.34	3,989.34	0.11	0.07	4,014.14
Unmitigated	30.05	1.42	93.67	0.23		0.00	11.96		0.00	11.96	1,547.47	3,989.45	5,536.93	7.35	0.07	5,713.64
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	4.05					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	17.11					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	8.20	1.16	70.87	0.23		0.00	11.83		0.00	11.83	1,547.47	3,952.15	5,499.62	7.31	0.07	5,675.59
Landscaping	0.68	0.26	22.80	0.00		0.00	0.13		0.00	0.13	0.00	37.30	37.30	0.04	0.00	38.05
Total	**30.04**	**1.42**	**93.67**	**0.23**		**0.00**	**11.96**		**0.00**	**11.96**	**1,547.47**	**3,989.45**	**5,536.92**	**7.35**	**0.07**	**5,713.64**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	4.05					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	17.11					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.40	0.00	0.02	0.00		0.00	0.28		0.00	0.27	0.00	3,952.15	3,952.15	0.08	0.07	3,976.20
Landscaping	0.68	0.26	22.75	0.00		0.00	0.13		0.00	0.13	0.00	37.19	37.19	0.04	0.00	37.94
Total	**22.24**	**0.26**	**22.77**	**0.00**		**0.00**	**0.41**		**0.00**	**0.40**	**0.00**	**3,989.34**	**3,989.34**	**0.12**	**0.07**	**4,014.14**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					866.97	6.28	0.17	1,051.32
Unmitigated					866.97	6.28	0.17	1,051.32
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	63.1994 / 39.8431					140.76	1.94	0.05	196.98
Apartments Mid Rise	44.3047 / 27.9312					98.68	1.36	0.04	138.09
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	90.6292 / 57.1358					201.85	2.78	0.07	282.47
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**866.96**	**6.29**	**0.16**	**1,051.32**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	63.1994 / 39.8431					140.76	1.94	0.05	196.98
Apartments Mid Rise	44.3047 / 27.9312					98.68	1.36	0.04	138.09
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	90.6292 / 57.1358					201.85	2.78	0.07	282.47
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**866.96**	**6.29**	**0.16**	**1,051.32**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					593.17	35.06	0.00	1,329.34
Unmitigated					593.17	35.06	0.00	1,329.34
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	446.2					90.57	5.35	0.00	202.98
Apartments Mid Rise	312.8					63.50	3.75	0.00	142.30
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	1660.01					336.97	19.91	0.00	755.16
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**593.19**	**35.05**	**0.00**	**1,329.33**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	446.2					90.57	5.35	0.00	202.98
Apartments Mid Rise	312.8					63.50	3.75	0.00	142.30
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	1660.01					336.97	19.91	0.00	755.16
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**593.19**	**35.05**	**0.00**	**1,329.33**

9.0 Vegetation

River Islands Operation - Proposed Project 2029

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	10	User Defined Unit
Elementary School	138	1000sqft
High School	200	1000sqft
Junior High School	64	1000sqft
City Park	180.83	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	1058	Dwelling Unit
Apartments Mid Rise	830	Dwelling Unit
Single Family Housing	1816	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Wind Speed (m/s) 2.7

Utility Company Pacific Gas & Electric Company

Climate Zone 2

Precipitation Freq (Days) 45

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - -

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	51.46	0.23	1.44	0.00	0.19	0.01	0.21	0.00	0.01	0.02	0.00	155.67	155.67	0.01	0.00	155.92
Total	**51.46**	**0.23**	**1.44**	**0.00**	**0.19**	**0.01**	**0.21**	**0.00**	**0.01**	**0.02**	**0.00**	**155.67**	**155.67**	**0.01**	**0.00**	**155.92**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	51.46	0.23	1.44	0.00	0.01	0.01	0.02	0.00	0.01	0.02	0.00	155.67	155.67	0.01	0.00	155.92
Total	**51.46**	**0.23**	**1.44**	**0.00**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.02**	**0.00**	**155.67**	**155.67**	**0.01**	**0.00**	**155.92**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	39.06	1.92	125.92	0.32		0.00	16.50		0.00	16.49	2,143.21	4,859.24	7,002.44	10.15	0.09	7,243.05
Energy	0.52	4.46	1.99	0.03		0.00	0.36		0.00	0.36	0.00	11,626.64	11,626.64	0.39	0.21	11,698.57
Mobile	30.69	139.47	246.80	0.77	68.03	4.50	72.53	1.27	4.10	5.37	0.00	68,492.22	68,492.22	1.74	0.00	68,528.80
Waste						0.00	0.00		0.00	0.00	771.13	0.00	771.13	45.57	0.00	1,728.15
Water						0.00	0.00		0.00	0.00	0.00	991.09	991.09	7.80	0.21	1,219.87
Total	**70.27**	**145.85**	**374.71**	**1.12**	**68.03**	**4.50**	**89.39**	**1.27**	**4.10**	**22.22**	**2,914.34**	**85,969.19**	**88,883.52**	**65.65**	**0.51**	**90,418.44**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	28.26	0.32	27.73	0.00		0.00	0.49		0.00	0.49	0.00	4,859.10	4,859.10	0.14	0.09	4,889.31
Energy	0.52	4.46	1.99	0.03		0.00	0.36		0.00	0.36	0.00	11,626.64	11,626.64	0.39	0.21	11,698.57
Mobile	30.69	139.47	246.80	0.77	68.03	4.50	72.53	1.27	4.10	5.37	0.00	68,492.22	68,492.22	1.74	0.00	68,528.80
Waste						0.00	0.00		0.00	0.00	771.13	0.00	771.13	45.57	0.00	1,728.15
Water						0.00	0.00		0.00	0.00	0.00	991.09	991.09	7.80	0.21	1,219.87
Total	**59.47**	**144.25**	**276.52**	**0.80**	**68.03**	**4.50**	**73.38**	**1.27**	**4.10**	**6.22**	**771.13**	**85,969.05**	**86,740.18**	**55.64**	**0.51**	**88,064.70**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	51.33					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.08	0.05	0.00		0.01	0.01		0.01	0.01	0.00	6.38	6.38	0.00	0.00	6.40
Total	**51.34**	**0.08**	**0.05**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**6.38**	**6.38**	**0.00**	**0.00**	**6.40**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.12	0.14	1.39	0.00	0.19	0.01	0.20	0.00	0.01	0.01	0.00	149.29	149.29	0.01	0.00	149.52
Total	**0.12**	**0.14**	**1.39**	**0.00**	**0.19**	**0.01**	**0.20**	**0.00**	**0.01**	**0.01**	**0.00**	**149.29**	**149.29**	**0.01**	**0.00**	**149.52**

3.2 Architectural Coating - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	51.33					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.08	0.05	0.00		0.01	0.01		0.01	0.01	0.00	6.38	6.38	0.00	0.00	6.40
Total	**51.34**	**0.08**	**0.05**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**6.38**	**6.38**	**0.00**	**0.00**	**6.40**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.12	0.14	1.39	0.00	0.01	0.01	0.02	0.00	0.01	0.01	0.00	149.29	149.29	0.01	0.00	149.52
Total	**0.12**	**0.14**	**1.39**	**0.00**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.01**	**0.00**	**149.29**	**149.29**	**0.01**	**0.00**	**149.52**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	30.69	139.47	246.80	0.77	68.03	4.50	72.53	1.27	4.10	5.37	0.00	68,492.22	68,492.22	1.74	0.00	68,528.80
Unmitigated	30.69	139.47	246.80	0.77	68.03	4.50	72.53	1.27	4.10	5.37	0.00	68,492.22	68,492.22	1.74	0.00	68,528.80
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	6,972.22	7,575.28	6422.06	26,628,893	26,628,893
Apartments Mid Rise	5,469.70	5,942.80	5038.10	20,890,342	20,890,342
City Park	287.52	287.52	287.52	709,083	709,083
Elementary School	2,129.34	0.00	0.00	4,555,538	4,555,538
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
High School	2,578.00	874.00	358.00	7,560,208	7,560,208
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	17,379.12	18,305.28	15926.32	66,016,911	66,016,911
User Defined Commercial	55.20	55.20	55.20	122,667	122,667
Total	37,002.97	34,226.13	29,370.15	130,892,863	130,892,863

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
High School	14.70	6.60	6.60	77.80	17.20	5.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	6,474.05	6,474.05	0.29	0.11	6,514.62
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	6,474.05	6,474.05	0.29	0.11	6,514.62
NaturalGas Mitigated	0.52	4.46	1.99	0.03		0.00	0.36		0.00	0.36	0.00	5,152.59	5,152.59	0.10	0.09	5,183.95
NaturalGas Unmitigated	0.52	4.46	1.99	0.03		0.00	0.36		0.00	0.36	0.00	5,152.59	5,152.59	0.10	0.09	5,183.95
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.51378e+007	0.08	0.70	0.30	0.00		0.00	0.06		0.00	0.06	0.00	807.81	807.81	0.02	0.01	812.73
Apartments Mid Rise	1.11171e+007	0.06	0.51	0.22	0.00		0.00	0.04		0.00	0.04	0.00	593.25	593.25	0.01	0.01	596.86
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	6.6011e+007	0.36	3.04	1.29	0.02		0.00	0.25		0.00	0.25	0.00	3,522.60	3,522.60	0.07	0.06	3,544.04
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.52**	**4.46**	**1.99**	**0.02**		**0.00**	**0.37**		**0.00**	**0.37**	**0.00**	**5,152.60**	**5,152.60**	**0.10**	**0.08**	**5,183.95**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.51378e+007	0.08	0.70	0.30	0.00		0.00	0.06		0.00	0.06	0.00	807.81	807.81	0.02	0.01	812.73
Apartments Mid Rise	1.11171e+007	0.06	0.51	0.22	0.00		0.00	0.04		0.00	0.04	0.00	593.25	593.25	0.01	0.01	596.86
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	6.6011e+007	0.36	3.04	1.29	0.02		0.00	0.25		0.00	0.25	0.00	3,522.60	3,522.60	0.07	0.06	3,544.04
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.52**	**4.46**	**1.99**	**0.02**		**0.00**	**0.37**		**0.00**	**0.37**	**0.00**	**5,152.60**	**5,152.60**	**0.10**	**0.08**	**5,183.95**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	4.04722e+006					1,177.38	0.05	0.02	1,184.76
Apartments Mid Rise	3.03992e+006					884.35	0.04	0.02	889.89
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.24479e+007					3,621.25	0.16	0.06	3,643.94
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**6,474.06**	**0.29**	**0.11**	**6,514.62**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	4.04722e+006					1,177.38	0.05	0.02	1,184.76
Apartments Mid Rise	3.03992e+006					884.35	0.04	0.02	889.89
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.24479e+007					3,621.25	0.16	0.06	3,643.94
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**6,474.06**	**0.29**	**0.11**	**6,514.62**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	28.26	0.32	27.73	0.00		0.00	0.49		0.00	0.49	0.00	4,859.10	4,859.10	0.14	0.09	4,889.31
Unmitigated	39.06	1.92	125.92	0.32		0.00	16.50		0.00	16.49	2,143.21	4,859.24	7,002.44	10.15	0.09	7,243.05
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.13					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	21.81					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	11.29	1.60	98.14	0.32		0.00	16.34		0.00	16.34	2,143.21	4,813.80	6,957.01	10.11	0.09	7,196.71
Landscaping	0.83	0.32	27.77	0.00		0.00	0.15		0.00	0.15	0.00	45.44	45.44	0.04	0.00	46.35
Total	**39.06**	**1.92**	**125.91**	**0.32**		**0.00**	**16.49**		**0.00**	**16.49**	**2,143.21**	**4,859.24**	**7,002.45**	**10.15**	**0.09**	**7,243.06**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.13					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	21.81					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.49	0.00	0.03	0.00		0.00	0.34		0.00	0.33	0.00	4,813.80	4,813.80	0.09	0.09	4,843.10
Landscaping	0.83	0.32	27.71	0.00		0.00	0.15		0.00	0.15	0.00	45.30	45.30	0.04	0.00	46.21
Total	**28.26**	**0.32**	**27.74**	**0.00**		**0.00**	**0.49**		**0.00**	**0.48**	**0.00**	**4,859.10**	**4,859.10**	**0.13**	**0.09**	**4,889.31**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					991.09	7.80	0.21	1,219.87
Unmitigated					991.09	7.80	0.21	1,219.87
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	68.933 / 43.4577					153.53	2.11	0.05	214.85
Apartments Mid Rise	54.0778 / 34.0926					120.44	1.66	0.04	168.55
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	118.32 / 74.5929					263.53	3.62	0.09	368.78
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**991.09**	**7.80**	**0.19**	**1,219.87**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	68.933 / 43.4577					153.53	2.11	0.05	214.85
Apartments Mid Rise	54.0778 / 34.0926					120.44	1.66	0.04	168.55
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	118.32 / 74.5929					263.53	3.62	0.09	368.78
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**991.09**	**7.80**	**0.19**	**1,219.87**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					771.13	45.57	0.00	1,728.15
Unmitigated					771.13	45.57	0.00	1,728.15
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	486.68					98.79	5.84	0.00	221.40
Apartments Mid Rise	381.8					77.50	4.58	0.00	173.69
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	2167.2					439.92	26.00	0.00	985.89
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**771.14**	**45.58**	**0.00**	**1,728.15**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	486.68					98.79	5.84	0.00	221.40
Apartments Mid Rise	381.8					77.50	4.58	0.00	173.69
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	2167.2					439.92	26.00	0.00	985.89
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**771.14**	**45.58**	**0.00**	**1,728.15**

9.0 Vegetation

River Islands Operation - Proposed Project 2030

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	10	User Defined Unit
Elementary School	138	1000sqft
High School	200	1000sqft
Junior High School	64	1000sqft
City Park	180.83	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	1145	Dwelling Unit
Apartments Mid Rise	980	Dwelling Unit
Single Family Housing	2241	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Wind Speed (m/s) 2.7

Utility Company Pacific Gas & Electric Company

Climate Zone 2

Precipitation Freq (Days) 45

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - -

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	60.85	0.20	1.35	0.00	0.18	0.01	0.19	0.00	0.01	0.02	0.00	145.81	145.81	0.01	0.00	146.05
Total	**60.85**	**0.20**	**1.35**	**0.00**	**0.18**	**0.01**	**0.19**	**0.00**	**0.01**	**0.02**	**0.00**	**145.81**	**145.81**	**0.01**	**0.00**	**146.05**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	60.85	0.20	1.35	0.00	0.01	0.01	0.02	0.00	0.01	0.02	0.00	145.81	145.81	0.01	0.00	146.05
Total	**60.85**	**0.20**	**1.35**	**0.00**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.02**	**0.00**	**145.81**	**145.81**	**0.01**	**0.00**	**146.05**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	47.15	2.42	158.11	0.41		0.00	21.03		0.00	21.03	2,739.27	5,727.71	8,466.97	12.97	0.10	8,771.49
Energy	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	13,728.80	13,728.80	0.46	0.24	13,813.72
Mobile	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Waste						0.00	0.00		0.00	0.00	896.21	0.00	896.21	52.96	0.00	2,008.47
Water						0.00	0.00		0.00	0.00	0.00	1,087.16	1,087.16	9.12	0.24	1,354.30
Total	**78.34**	**149.04**	**407.98**	**1.33**	**79.13**	**4.64**	**105.23**	**1.47**	**4.18**	**27.10**	**3,635.48**	**97,740.49**	**101,375.96**	**77.35**	**0.58**	**103,183.47**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	33.34	0.37	32.63	0.00		0.00	0.58		0.00	0.57	0.00	5,727.55	5,727.55	0.16	0.10	5,763.14
Energy	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	13,728.80	13,728.80	0.46	0.24	13,813.72
Mobile	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Waste						0.00	0.00		0.00	0.00	896.21	0.00	896.21	52.96	0.00	2,008.47
Water						0.00	0.00		0.00	0.00	0.00	1,087.16	1,087.16	9.12	0.24	1,354.30
Total	**64.53**	**146.99**	**282.50**	**0.92**	**79.13**	**4.64**	**84.78**	**1.47**	**4.18**	**6.64**	**896.21**	**97,740.33**	**98,636.54**	**64.54**	**0.58**	**100,175.12**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	60.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**60.73**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.11	0.13	1.31	0.00	0.18	0.01	0.19	0.00	0.01	0.01	0.00	140.58	140.58	0.01	0.00	140.81
Total	**0.11**	**0.13**	**1.31**	**0.00**	**0.18**	**0.01**	**0.19**	**0.00**	**0.01**	**0.01**	**0.00**	**140.58**	**140.58**	**0.01**	**0.00**	**140.81**

3.2 Architectural Coating - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	60.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**60.73**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.11	0.13	1.31	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	140.58	140.58	0.01	0.00	140.81
Total	**0.11**	**0.13**	**1.31**	**0.00**	**0.01**	**0.01**	**0.01**	**0.00**	**0.01**	**0.01**	**0.00**	**140.58**	**140.58**	**0.01**	**0.00**	**140.81**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Unmitigated	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	7,545.55	8,198.20	6950.15	28,818,604	28,818,604
Apartments Mid Rise	6,458.20	7,016.80	5948.60	24,665,705	24,665,705
City Park	287.52	287.52	287.52	709,083	709,083
Elementary School	2,129.34	0.00	0.00	4,555,538	4,555,538
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
High School	2,578.00	874.00	358.00	7,560,208	7,560,208
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	21,446.37	22,589.28	19653.57	81,466,904	81,466,904
User Defined Commercial	55.20	55.20	55.20	122,667	122,667
Total	42,632.05	40,207.05	34,535.99	152,307,930	152,307,930

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
High School	14.70	6.60	6.60	77.80	17.20	5.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	7,578.17	7,578.17	0.34	0.13	7,625.66
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	7,578.17	7,578.17	0.34	0.13	7,625.66
NaturalGas Mitigated	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	6,150.63	6,150.63	0.12	0.11	6,188.06
NaturalGas Unmitigated	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	6,150.63	6,150.63	0.12	0.11	6,188.06
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.63826e+007	0.09	0.75	0.32	0.00		0.00	0.06		0.00	0.06	0.00	874.24	874.24	0.02	0.02	879.56
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	8.14596e+007	0.44	3.75	1.60	0.02		0.00	0.30		0.00	0.30	0.00	4,346.99	4,346.99	0.08	0.08	4,373.45
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.62**	**5.31**	**2.36**	**0.02**		**0.00**	**0.43**		**0.00**	**0.43**	**0.00**	**6,150.64**	**6,150.64**	**0.11**	**0.11**	**6,188.06**

5.2 Energy by Land Use - NaturalGas

<u>Mitigated</u>

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.63826e+007	0.09	0.75	0.32	0.00		0.00	0.06		0.00	0.06	0.00	874.24	874.24	0.02	0.02	879.56
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	8.14596e+007	0.44	3.75	1.60	0.02		0.00	0.30		0.00	0.30	0.00	4,346.99	4,346.99	0.08	0.08	4,373.45
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.62**	**5.31**	**2.36**	**0.02**		**0.00**	**0.43**		**0.00**	**0.43**	**0.00**	**6,150.64**	**6,150.64**	**0.11**	**0.11**	**6,188.06**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	4.38003e+006					1,274.20	0.06	0.02	1,282.18
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.53611e+007					4,468.73	0.20	0.08	4,496.73
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**7,578.18**	**0.35**	**0.13**	**7,625.65**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	4.38003e+006					1,274.20	0.06	0.02	1,282.18
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.53611e+007					4,468.73	0.20	0.08	4,496.73
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**7,578.18**	**0.35**	**0.13**	**7,625.65**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	33.34	0.37	32.63	0.00		0.00	0.58		0.00	0.57	0.00	5,727.55	5,727.55	0.16	0.10	5,763.14
Unmitigated	47.15	2.42	158.11	0.41		0.00	21.03		0.00	21.03	2,739.27	5,727.71	8,466.97	12.97	0.10	8,771.49
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	6.07					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	25.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	14.38	2.05	125.44	0.41		0.00	20.85		0.00	20.85	2,739.27	5,674.15	8,413.42	12.91	0.10	8,716.87
Landscaping	0.98	0.38	32.68	0.00		0.00	0.18		0.00	0.18	0.00	53.56	53.56	0.05	0.00	54.63
Total	**47.15**	**2.43**	**158.12**	**0.41**		**0.00**	**21.03**		**0.00**	**21.03**	**2,739.27**	**5,727.71**	**8,466.98**	**12.96**	**0.10**	**8,771.50**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	6.07					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	25.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.57	0.00	0.03	0.00		0.00	0.40		0.00	0.39	0.00	5,674.15	5,674.15	0.11	0.10	5,708.68
Landscaping	0.97	0.37	32.60	0.00		0.00	0.18		0.00	0.18	0.00	53.40	53.40	0.05	0.00	54.46
Total	**33.33**	**0.37**	**32.63**	**0.00**		**0.00**	**0.58**		**0.00**	**0.57**	**0.00**	**5,727.55**	**5,727.55**	**0.16**	**0.10**	**5,763.14**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					1,087.16	9.12	0.24	1,354.30
Unmitigated					1,087.16	9.12	0.24	1,354.30
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	74.6014 / 47.0313					166.16	2.28	0.06	232.52
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	146.01 / 92.0499					325.20	4.47	0.12	455.09
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,087.16**	**9.12**	**0.24**	**1,354.31**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	74.6014 / 47.0313					166.16	2.28	0.06	232.52
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	146.01 / 92.0499					325.20	4.47	0.12	455.09
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,087.16**	**9.12**	**0.24**	**1,354.31**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					896.21	52.96	0.00	2,008.47
Unmitigated					896.21	52.96	0.00	2,008.47
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	526.7					106.92	6.32	0.00	239.60
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	2674.38					542.87	32.08	0.00	1,216.62
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**896.23**	**52.97**	**0.00**	**2,008.47**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	526.7					106.92	6.32	0.00	239.60
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	2674.38					542.87	32.08	0.00	1,216.62
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**896.23**	**52.97**	**0.00**	**2,008.47**

9.0 Vegetation

River Islands Operation - Proposed Project 2031

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	10	User Defined Unit
Elementary School	138	1000sqft
High School	200	1000sqft
Junior High School	64	1000sqft
City Park	180.83	Acre
Golf Course	150	Acre
Racquet Club	15	1000sqft
Apartments Low Rise	1145	Dwelling Unit
Apartments Mid Rise	980	Dwelling Unit
Single Family Housing	2241	Dwelling Unit

1.2 Other Project Characteristics

Urbanization Rural

Wind Speed (m/s) 2.7

Utility Company Pacific Gas & Electric Company

Climate Zone 2

Precipitation Freq (Days) 45

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - -

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	2.23	1.28	8.54	0.01	1.14	0.08	1.22	0.02	0.08	0.10	0.00	924.66	924.66	0.07	0.00	926.19
2012	2.17	1.17	7.72	0.01	1.14	0.08	1.22	0.02	0.08	0.09	0.00	906.90	906.90	0.07	0.00	908.29
2013	2.10	1.06	6.93	0.01	1.14	0.08	1.22	0.02	0.07	0.09	0.00	886.06	886.06	0.06	0.00	887.33
2014	2.03	0.96	6.22	0.01	1.14	0.07	1.21	0.02	0.07	0.09	0.00	865.73	865.73	0.05	0.00	866.88
2015	1.98	0.87	5.60	0.01	1.14	0.07	1.21	0.02	0.07	0.08	0.00	844.46	844.46	0.05	0.00	845.51
2016	1.93	0.79	5.07	0.01	1.14	0.06	1.21	0.02	0.06	0.08	0.00	823.52	823.52	0.05	0.00	824.47
2017	1.88	0.71	4.57	0.01	1.14	0.06	1.20	0.02	0.06	0.08	0.00	801.37	801.37	0.04	0.00	802.23
2018	1.85	0.65	4.17	0.01	1.14	0.06	1.20	0.02	0.06	0.07	0.00	787.10	787.10	0.04	0.00	787.90
2019	1.82	0.59	3.84	0.01	1.14	0.06	1.20	0.02	0.05	0.07	0.00	771.60	771.60	0.03	0.00	772.33
2020	1.80	0.54	3.57	0.01	1.15	0.05	1.20	0.02	0.05	0.07	0.00	760.57	760.57	0.03	0.00	761.25

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	1.78	0.49	3.40	0.01	1.14	0.05	1.20	0.02	0.05	0.07	0.00	767.72	767.72	0.03	0.00	768.39
2022	1.75	0.45	3.16	0.01	1.14	0.05	1.19	0.02	0.05	0.07	0.00	753.05	753.05	0.03	0.00	753.68
2023	1.74	0.42	2.96	0.01	1.14	0.05	1.19	0.02	0.05	0.07	0.00	742.45	742.45	0.03	0.00	743.05
2024	1.73	0.39	2.81	0.01	1.15	0.05	1.20	0.02	0.05	0.06	0.00	738.57	738.57	0.03	0.00	739.13
2025	1.71	0.36	2.66	0.01	1.14	0.05	1.19	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2026	1.71	0.36	2.66	0.01	1.14	0.05	1.19	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2027	1.71	0.36	2.66	0.01	1.14	0.05	1.19	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2028	1.71	0.36	2.65	0.01	1.14	0.05	1.19	0.02	0.04	0.06	0.00	724.49	724.49	0.03	0.00	725.03
2029	1.71	0.36	2.66	0.01	1.14	0.05	1.19	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2030	1.66	0.27	2.16	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	697.69	697.69	0.02	0.00	698.13
2031	1.66	0.27	2.16	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	697.69	697.69	0.02	0.00	698.13
2032	1.67	0.27	2.17	0.01	1.15	0.04	1.19	0.02	0.04	0.06	0.00	700.36	700.36	0.02	0.00	700.80
2033	1.65	0.27	2.15	0.01	1.14	0.04	1.18	0.02	0.04	0.06	0.00	695.01	695.01	0.02	0.00	695.46
2034	1.65	0.27	2.15	0.01	1.14	0.04	1.18	0.02	0.04	0.06	0.00	695.01	695.01	0.02	0.00	695.46
2035	1.62	0.22	1.88	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	682.72	682.72	0.02	0.00	683.10
2036	1.63	0.22	1.89	0.01	1.15	0.04	1.19	0.02	0.04	0.06	0.00	685.33	685.33	0.02	0.00	685.72
2037	1.62	0.22	1.88	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	682.72	682.72	0.02	0.00	683.10
2038	1.62	0.22	1.88	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	682.72	682.72	0.02	0.00	683.10
2039	1.62	0.22	1.87	0.01	1.14	0.04	1.18	0.02	0.04	0.06	0.00	680.10	680.10	0.02	0.00	680.48
2040	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2041	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2042	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2043	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2044	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2045	1.60	0.20	1.73	0.01	1.14	0.04	1.18	0.02	0.04	0.06	0.00	672.33	672.33	0.02	0.00	672.69
2046	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2047	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2048	1.61	0.20	1.75	0.01	1.15	0.04	1.19	0.02	0.04	0.06	0.00	677.50	677.50	0.02	0.00	677.86
2049	1.60	0.20	1.74	0.01	1.14	0.04	1.19	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2050	1.60	0.20	1.73	0.01	1.14	0.04	1.18	0.02	0.04	0.06	0.00	672.33	672.33	0.02	0.00	672.69
2051	1.60	0.20	1.73	0.01	1.14	0.04	1.18	0.02	0.04	0.06	0.00	672.33	672.33	0.02	0.00	672.69
2052	1.61	0.20	1.75	0.01	1.15	0.04	1.19	0.02	0.04	0.06	0.00	677.50	677.50	0.02	0.00	677.86
2053	0.26	0.03	0.29	0.00	0.19	0.01	0.20	0.00	0.01	0.01	0.00	111.19	111.19	0.00	0.00	111.25
Total	**72.82**	**17.25**	**124.94**	**0.42**	**48.13**	**2.05**	**50.33**	**0.84**	**2.02**	**2.78**	**0.00**	**30,789.18**	**30,789.18**	**1.22**	**0.00**	**30,813.70**

2.1 Overall Construction

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	2.23	1.28	8.54	0.01	0.05	0.08	0.13	0.02	0.08	0.10	0.00	924.66	924.66	0.07	0.00	926.19
2012	2.17	1.17	7.72	0.01	0.05	0.08	0.13	0.02	0.08	0.09	0.00	906.90	906.90	0.07	0.00	908.29

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2013	2.10	1.06	6.93	0.01	0.05	0.08	0.12	0.02	0.07	0.09	0.00	886.06	886.06	0.06	0.00	887.33
2014	2.03	0.96	6.22	0.01	0.05	0.07	0.12	0.02	0.07	0.09	0.00	865.73	865.73	0.05	0.00	866.88
2015	1.98	0.87	5.60	0.01	0.05	0.07	0.12	0.02	0.07	0.08	0.00	844.46	844.46	0.05	0.00	845.51
2016	1.93	0.79	5.07	0.01	0.05	0.06	0.11	0.02	0.06	0.08	0.00	823.52	823.52	0.05	0.00	824.47
2017	1.88	0.71	4.57	0.01	0.05	0.06	0.11	0.02	0.06	0.08	0.00	801.37	801.37	0.04	0.00	802.23
2018	1.85	0.65	4.17	0.01	0.05	0.06	0.11	0.02	0.06	0.07	0.00	787.10	787.10	0.04	0.00	787.90
2019	1.82	0.59	3.84	0.01	0.05	0.06	0.11	0.02	0.05	0.07	0.00	771.60	771.60	0.03	0.00	772.33
2020	1.80	0.54	3.57	0.01	0.05	0.05	0.10	0.02	0.05	0.07	0.00	760.57	760.57	0.03	0.00	761.25
2021	1.78	0.49	3.40	0.01	0.05	0.05	0.10	0.02	0.05	0.07	0.00	767.72	767.72	0.03	0.00	768.39
2022	1.75	0.45	3.16	0.01	0.05	0.05	0.10	0.02	0.05	0.07	0.00	753.05	753.05	0.03	0.00	753.68
2023	1.74	0.42	2.96	0.01	0.05	0.05	0.10	0.02	0.05	0.07	0.00	742.45	742.45	0.03	0.00	743.05
2024	1.73	0.39	2.81	0.01	0.05	0.05	0.10	0.02	0.05	0.06	0.00	738.57	738.57	0.03	0.00	739.13
2025	1.71	0.36	2.66	0.01	0.05	0.05	0.10	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2026	1.71	0.36	2.66	0.01	0.05	0.05	0.10	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2027	1.71	0.36	2.66	0.01	0.05	0.05	0.10	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2028	1.71	0.36	2.65	0.01	0.05	0.05	0.10	0.02	0.04	0.06	0.00	724.49	724.49	0.03	0.00	725.03
2029	1.71	0.36	2.66	0.01	0.05	0.05	0.10	0.02	0.05	0.06	0.00	727.28	727.28	0.03	0.00	727.82
2030	1.66	0.27	2.16	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	697.69	697.69	0.02	0.00	698.13
2031	1.66	0.27	2.16	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	697.69	697.69	0.02	0.00	698.13
2032	1.67	0.27	2.17	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	700.36	700.36	0.02	0.00	700.80
2033	1.65	0.27	2.15	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	695.01	695.01	0.02	0.00	695.46

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2034	1.65	0.27	2.15	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	695.01	695.01	0.02	0.00	695.46
2035	1.62	0.22	1.88	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	682.72	682.72	0.02	0.00	683.10
2036	1.63	0.22	1.89	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	685.33	685.33	0.02	0.00	685.72
2037	1.62	0.22	1.88	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	682.72	682.72	0.02	0.00	683.10
2038	1.62	0.22	1.88	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	682.72	682.72	0.02	0.00	683.10
2039	1.62	0.22	1.87	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	680.10	680.10	0.02	0.00	680.48
2040	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2041	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2042	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2043	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2044	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2045	1.60	0.20	1.73	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	672.33	672.33	0.02	0.00	672.69
2046	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2047	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2048	1.61	0.20	1.75	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	677.50	677.50	0.02	0.00	677.86
2049	1.60	0.20	1.74	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	674.91	674.91	0.02	0.00	675.28
2050	1.60	0.20	1.73	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	672.33	672.33	0.02	0.00	672.69
2051	1.60	0.20	1.73	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	672.33	672.33	0.02	0.00	672.69
2052	1.61	0.20	1.75	0.01	0.05	0.04	0.09	0.02	0.04	0.06	0.00	677.50	677.50	0.02	0.00	677.86
2053	0.26	0.03	0.29	0.00	0.01	0.01	0.02	0.00	0.01	0.01	0.00	111.19	111.19	0.00	0.00	111.25
Total	**72.82**	**17.25**	**124.94**	**0.42**	**2.11**	**2.05**	**4.15**	**0.84**	**2.02**	**2.78**	**0.00**	**30,789.18**	**30,789.18**	**1.22**	**0.00**	**30,813.70**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	50.16	2.87	185.39	0.50		0.00	25.48		0.00	25.48	3,335.04	5,727.71	9,062.75	15.75	0.10	9,425.76
Energy	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	13,728.80	13,728.80	0.46	0.24	13,813.72
Mobile	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Waste						0.00	0.00		0.00	0.00	896.21	0.00	896.21	52.96	0.00	2,008.47
Water						0.00	0.00		0.00	0.00	0.00	1,087.16	1,087.16	9.12	0.24	1,354.30
Total	**81.35**	**149.49**	**435.26**	**1.42**	**79.13**	**4.64**	**109.68**	**1.47**	**4.18**	**31.55**	**4,231.25**	**97,740.49**	**101,971.74**	**80.13**	**0.58**	**103,837.74**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	33.34	0.37	32.63	0.00		0.00	0.58		0.00	0.57	0.00	5,727.55	5,727.55	0.16	0.10	5,763.14
Energy	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	13,728.80	13,728.80	0.46	0.24	13,813.72
Mobile	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Waste						0.00	0.00		0.00	0.00	896.21	0.00	896.21	52.96	0.00	2,008.47
Water						0.00	0.00		0.00	0.00	0.00	1,087.16	1,087.16	9.12	0.24	1,354.30
Total	**64.53**	**146.99**	**282.50**	**0.92**	**79.13**	**4.64**	**84.78**	**1.47**	**4.18**	**6.64**	**896.21**	**97,740.33**	**98,636.54**	**64.54**	**0.58**	**100,175.12**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2053

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.24					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.00	0.02	0.04	0.00		0.00	0.00		0.00	0.00	0.00	5.48	5.48	0.00	0.00	5.49
Total	**0.24**	**0.02**	**0.04**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**5.48**	**5.48**	**0.00**	**0.00**	**5.49**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.02	0.02	0.25	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	105.71	105.71	0.00	0.00	105.77
Total	**0.02**	**0.02**	**0.25**	**0.00**	**0.01**	**0.01**	**0.01**	**0.00**	**0.01**	**0.01**	**0.00**	**105.71**	**105.71**	**0.00**	**0.00**	**105.77**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Mitigated	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Unmitigated	30.57	141.30	247.52	0.89	79.13	4.64	83.77	1.47	4.18	5.64	0.00	77,196.82	77,196.82	1.84	0.00	77,235.49
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	7,545.55	8,198.20	6950.15	28,818,604	28,818,604
Apartments Mid Rise	6,458.20	7,016.80	5948.60	24,665,705	24,665,705
City Park	287.52	287.52	287.52	709,083	709,083
Elementary School	2,129.34	0.00	0.00	4,555,538	4,555,538
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
High School	2,578.00	874.00	358.00	7,560,208	7,560,208
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	21,446.37	22,589.28	19653.57	81,466,904	81,466,904
User Defined Commercial	55.20	55.20	55.20	122,667	122,667
Total	42,632.05	40,207.05	34,535.99	152,307,930	152,307,930

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
High School	14.70	6.60	6.60	77.80	17.20	5.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	7,578.17	7,578.17	0.34	0.13	7,625.66
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	7,578.17	7,578.17	0.34	0.13	7,625.66
NaturalGas Mitigated	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	6,150.63	6,150.63	0.12	0.11	6,188.06
NaturalGas Unmitigated	0.62	5.32	2.35	0.03		0.00	0.43		0.00	0.43	0.00	6,150.63	6,150.63	0.12	0.11	6,188.06
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.63826e+007	0.09	0.75	0.32	0.00		0.00	0.06		0.00	0.06	0.00	874.24	874.24	0.02	0.02	879.56
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	8.14596e+007	0.44	3.75	1.60	0.02		0.00	0.30		0.00	0.30	0.00	4,346.99	4,346.99	0.08	0.08	4,373.45
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.62**	**5.31**	**2.36**	**0.02**		**0.00**	**0.43**		**0.00**	**0.43**	**0.00**	**6,150.64**	**6,150.64**	**0.11**	**0.11**	**6,188.06**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.63826e+007	0.09	0.75	0.32	0.00		0.00	0.06		0.00	0.06	0.00	874.24	874.24	0.02	0.02	879.56
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	8.14596e+007	0.44	3.75	1.60	0.02		0.00	0.30		0.00	0.30	0.00	4,346.99	4,346.99	0.08	0.08	4,373.45
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.62**	**5.31**	**2.36**	**0.02**		**0.00**	**0.43**		**0.00**	**0.43**	**0.00**	**6,150.64**	**6,150.64**	**0.11**	**0.11**	**6,188.06**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	4.38003e+006					1,274.20	0.06	0.02	1,282.18
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.53611e+007					4,468.73	0.20	0.08	4,496.73
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**7,578.18**	**0.35**	**0.13**	**7,625.65**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	4.38003e+006					1,274.20	0.06	0.02	1,282.18
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.53611e+007					4,468.73	0.20	0.08	4,496.73
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**7,578.18**	**0.35**	**0.13**	**7,625.65**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	33.34	0.37	32.63	0.00		0.00	0.58		0.00	0.57	0.00	5,727.55	5,727.55	0.16	0.10	5,763.14
Unmitigated	50.16	2.87	185.39	0.50		0.00	25.48		0.00	25.48	3,335.04	5,727.71	9,062.75	15.75	0.10	9,425.76
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	6.07					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	25.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	17.39	2.49	152.71	0.50		0.00	25.30		0.00	25.30	3,335.04	5,674.15	9,009.19	15.70	0.10	9,371.13
Landscaping	0.98	0.38	32.68	0.00		0.00	0.18		0.00	0.18	0.00	53.56	53.56	0.05	0.00	54.63
Total	**50.16**	**2.87**	**185.39**	**0.50**		**0.00**	**25.48**		**0.00**	**25.48**	**3,335.04**	**5,727.71**	**9,062.75**	**15.75**	**0.10**	**9,425.76**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	6.07					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	25.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.57	0.00	0.03	0.00		0.00	0.40		0.00	0.39	0.00	5,674.15	5,674.15	0.11	0.10	5,708.68
Landscaping	0.97	0.37	32.60	0.00		0.00	0.18		0.00	0.18	0.00	53.40	53.40	0.05	0.00	54.46
Total	**33.33**	**0.37**	**32.63**	**0.00**		**0.00**	**0.58**		**0.00**	**0.57**	**0.00**	**5,727.55**	**5,727.55**	**0.16**	**0.10**	**5,763.14**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					1,087.16	9.12	0.24	1,354.30
Unmitigated					1,087.16	9.12	0.24	1,354.30
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	74.6014 / 47.0313					166.16	2.28	0.06	232.52
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	146.01 / 92.0499					325.20	4.47	0.12	455.09
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,087.16**	**9.12**	**0.24**	**1,354.31**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	74.6014 / 47.0313					166.16	2.28	0.06	232.52
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	146.01 / 92.0499					325.20	4.47	0.12	455.09
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,087.16**	**9.12**	**0.24**	**1,354.31**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					896.21	52.96	0.00	2,008.47
Unmitigated					896.21	52.96	0.00	2,008.47
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	526.7					106.92	6.32	0.00	239.60
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	2674.38					542.87	32.08	0.00	1,216.62
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**896.23**	**52.97**	**0.00**	**2,008.47**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	526.7					106.92	6.32	0.00	239.60
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	2674.38					542.87	32.08	0.00	1,216.62
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**896.23**	**52.97**	**0.00**	**2,008.47**

9.0 Vegetation

River Islands Operation - Proposed Project 2032

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	10	User Defined Unit
Elementary School	138	1000sqft
High School	200	1000sqft
Junior High School	64	1000sqft
City Park	180.83	Acre
Golf Course	150	Acre
Hotel	163	Room
Racquet Club	15	1000sqft
Apartments Low Rise	1320	Dwelling Unit
Apartments Mid Rise	980	Dwelling Unit
Single Family Housing	2654	Dwelling Unit
Strip Mall	416.67	1000sqft

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	2	**Precipitation Freq (Days)**	45		

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - -

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	74.02	0.23	1.61	0.00	0.22	0.01	0.23	0.00	0.01	0.02	0.00	174.32	174.32	0.01	0.00	174.61
Total	**74.02**	**0.23**	**1.61**	**0.00**	**0.22**	**0.01**	**0.23**	**0.00**	**0.01**	**0.02**	**0.00**	**174.32**	**174.32**	**0.01**	**0.00**	**174.61**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	74.02	0.23	1.61	0.00	0.01	0.01	0.02	0.00	0.01	0.02	0.00	174.32	174.32	0.01	0.00	174.61
Total	**74.02**	**0.23**	**1.61**	**0.00**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.02**	**0.00**	**174.32**	**174.32**	**0.01**	**0.00**	**174.61**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	57.82	2.92	189.79	0.50		0.00	25.56		0.00	25.56	3,335.04	6,499.10	9,834.14	15.77	0.12	10,201.94
Energy	0.78	6.71	3.18	0.04		0.00	0.54		0.00	0.54	0.00	18,450.96	18,450.96	0.63	0.33	18,565.19
Mobile	42.65	204.08	342.11	1.19	104.58	6.18	110.76	1.94	5.57	7.50	0.00	102,924.59	102,924.59	2.50	0.00	102,977.14
Waste						0.00	0.00		0.00	0.00	1,119.53	0.00	1,119.53	66.16	0.00	2,508.93
Water						0.00	0.00		0.00	0.00	0.00	1,247.70	1,247.70	11.37	0.30	1,580.04
Total	**101.25**	**213.71**	**535.08**	**1.73**	**104.58**	**6.18**	**136.86**	**1.94**	**5.57**	**33.60**	**4,454.57**	**129,122.35**	**133,576.92**	**96.43**	**0.75**	**135,833.24**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	41.00	0.43	37.03	0.00		0.00	0.65		0.00	0.65	0.00	6,498.92	6,498.92	0.18	0.12	6,539.31
Energy	0.78	6.71	3.18	0.04		0.00	0.54		0.00	0.54	0.00	18,450.96	18,450.96	0.63	0.33	18,565.19
Mobile	42.65	204.08	342.11	1.19	104.58	6.18	110.76	1.94	5.57	7.50	0.00	102,924.59	102,924.59	2.50	0.00	102,977.14
Waste						0.00	0.00		0.00	0.00	1,119.53	0.00	1,119.53	66.16	0.00	2,508.93
Water						0.00	0.00		0.00	0.00	0.00	1,247.70	1,247.70	11.37	0.30	1,580.04
Total	**84.43**	**211.22**	**382.32**	**1.23**	**104.58**	**6.18**	**111.95**	**1.94**	**5.57**	**8.69**	**1,119.53**	**129,122.17**	**130,241.70**	**80.84**	**0.75**	**132,170.61**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2011

<u>Unmitigated Construction On-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	73.87					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**73.88**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.14	0.16	1.57	0.00	0.22	0.01	0.22	0.00	0.01	0.01	0.00	169.09	169.09	0.01	0.00	169.36
Total	**0.14**	**0.16**	**1.57**	**0.00**	**0.22**	**0.01**	**0.22**	**0.00**	**0.01**	**0.01**	**0.00**	**169.09**	**169.09**	**0.01**	**0.00**	**169.36**

3.2 Architectural Coating - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	73.87					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**73.88**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.14	0.16	1.57	0.00	0.01	0.01	0.02	0.00	0.01	0.01	0.00	169.09	169.09	0.01	0.00	169.36
Total	**0.14**	**0.16**	**1.57**	**0.00**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.01**	**0.00**	**169.09**	**169.09**	**0.01**	**0.00**	**169.36**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	42.65	204.08	342.11	1.19	104.58	6.18	110.76	1.94	5.57	7.50	0.00	102,924.59	102,924.59	2.50	0.00	102,977.14
Unmitigated	42.65	204.08	342.11	1.19	104.58	6.18	110.76	1.94	5.57	7.50	0.00	102,924.59	102,924.59	2.50	0.00	102,977.14
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	8,698.80	9,451.20	8012.40	33,223,194	33,223,194
Apartments Mid Rise	6,458.20	7,016.80	5948.60	24,665,705	24,665,705
City Park	287.52	287.52	287.52	709,083	709,083
Elementary School	2,129.34	0.00	0.00	4,555,538	4,555,538
Golf Course	756.00	873.00	882.00	1,650,670	1,650,670
High School	2,578.00	874.00	358.00	7,560,208	7,560,208
Hotel	1,331.71	1,334.97	969.85	2,572,704	2,572,704
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	493.95	313.05	400.95	771,437	771,437
Single Family Housing	25,398.78	26,752.32	23275.58	96,480,662	96,480,662
Strip Mall	18,466.81	17,516.81	8512.57	26,986,340	26,986,340

Land Use	Average Daily Trip Rate			Unmitigated	Mitigated
	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Commercial	55.20	55.20	55.20	122,667	122,667
Total	67,536.23	64,474.87	48,702.67	201,285,321	201,285,321

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
High School	14.70	6.60	6.60	77.80	17.20	5.00
Hotel	14.70	6.60	6.60	19.40	61.60	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
Strip Mall	14.70	6.60	6.60	16.60	64.40	19.00
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	10,737.30	10,737.30	0.49	0.18	10,804.58
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	10,737.30	10,737.30	0.49	0.18	10,804.58
NaturalGas Mitigated	0.78	6.71	3.18	0.04		0.00	0.54		0.00	0.54	0.00	7,713.66	7,713.66	0.15	0.14	7,760.61
NaturalGas Unmitigated	0.78	6.71	3.18	0.04		0.00	0.54		0.00	0.54	0.00	7,713.66	7,713.66	0.15	0.14	7,760.61
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.88865e+007	0.10	0.87	0.37	0.01		0.00	0.07		0.00	0.07	0.00	1,007.85	1,007.85	0.02	0.02	1,013.99
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	6.65296e+006	0.04	0.33	0.27	0.00		0.00	0.02		0.00	0.02	0.00	355.03	355.03	0.01	0.01	357.19
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	9.6472e+007	0.52	4.45	1.89	0.03		0.00	0.36		0.00	0.36	0.00	5,148.11	5,148.11	0.10	0.09	5,179.44
Strip Mall	5.12087e+006	0.03	0.25	0.21	0.00		0.00	0.02		0.00	0.02	0.00	273.27	273.27	0.01	0.01	274.93
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.78**	**6.71**	**3.18**	**0.04**		**0.00**	**0.54**		**0.00**	**0.54**	**0.00**	**7,713.67**	**7,713.67**	**0.15**	**0.14**	**7,760.60**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	1.88865e+007	0.10	0.87	0.37	0.01		0.00	0.07		0.00	0.07	0.00	1,007.85	1,007.85	0.02	0.02	1,013.99
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	6.65296e+006	0.04	0.33	0.27	0.00		0.00	0.02		0.00	0.02	0.00	355.03	355.03	0.01	0.01	357.19
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	294150	0.00	0.01	0.01	0.00		0.00	0.00		0.00	0.00	0.00	15.70	15.70	0.00	0.00	15.79
Single Family Housing	9.6472e+007	0.52	4.45	1.89	0.03		0.00	0.36		0.00	0.36	0.00	5,148.11	5,148.11	0.10	0.09	5,179.44
Strip Mall	5.12087e+006	0.03	0.25	0.21	0.00		0.00	0.02		0.00	0.02	0.00	273.27	273.27	0.01	0.01	274.93
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.78**	**6.71**	**3.18**	**0.04**		**0.00**	**0.54**		**0.00**	**0.54**	**0.00**	**7,713.67**	**7,713.67**	**0.15**	**0.14**	**7,760.60**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	5.04946e+006					1,468.95	0.07	0.03	1,478.15
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	1.7798e+006					517.77	0.02	0.01	521.01
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.81921e+007					5,292.29	0.24	0.09	5,325.45
Strip Mall	5.57921e+006					1,623.06	0.07	0.03	1,633.23
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**10,737.32**	**0.49**	**0.19**	**10,804.58**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	5.04946e+006					1,468.95	0.07	0.03	1,478.15
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	1.7798e+006					517.77	0.02	0.01	521.01
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	138450					40.28	0.00	0.00	40.53
Single Family Housing	1.81921e+007					5,292.29	0.24	0.09	5,325.45
Strip Mall	5.57921e+006					1,623.06	0.07	0.03	1,633.23
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**10,737.32**	**0.49**	**0.19**	**10,804.58**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	41.00	0.43	37.03	0.00		0.00	0.65		0.00	0.65	0.00	6,498.92	6,498.92	0.18	0.12	6,539.31
Unmitigated	57.82	2.92	189.79	0.50		0.00	25.56		0.00	25.56	3,335.04	6,499.10	9,834.14	15.77	0.12	10,201.94
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	7.39					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	31.86					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	17.46	2.49	152.71	0.50		0.00	25.36		0.00	25.35	3,335.04	6,438.33	9,773.37	15.71	0.12	10,139.96
Landscaping	1.11	0.43	37.08	0.00		0.00	0.21		0.00	0.21	0.00	60.77	60.77	0.06	0.00	61.98
Total	**57.82**	**2.92**	**189.79**	**0.50**		**0.00**	**25.57**		**0.00**	**25.56**	**3,335.04**	**6,499.10**	**9,834.14**	**15.77**	**0.12**	**10,201.94**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	7.39					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	31.86					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.65	0.00	0.04	0.00		0.00	0.45		0.00	0.44	0.00	6,438.33	6,438.33	0.12	0.12	6,477.51
Landscaping	1.10	0.43	36.99	0.00		0.00	0.20		0.00	0.20	0.00	60.59	60.59	0.06	0.00	61.80
Total	**41.00**	**0.43**	**37.03**	**0.00**		**0.00**	**0.65**		**0.00**	**0.64**	**0.00**	**6,498.92**	**6,498.92**	**0.18**	**0.12**	**6,539.31**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					1,247.70	11.37	0.30	1,580.04
Unmitigated					1,247.70	11.37	0.30	1,580.04
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	86.0033 / 54.2195					191.55	2.63	0.07	268.06
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	4.13478 / 0.45942					7.02	0.13	0.00	10.69
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	172.919 / 109.014					385.13	5.30	0.14	538.96
Strip Mall	30.8638 / 18.9165					68.19	0.95	0.02	95.64
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,247.69**	**11.38**	**0.29**	**1,580.05**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	86.0033 / 54.2195					191.55	2.63	0.07	268.06
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 215.456					219.37	0.01	0.00	220.75
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 178.722					181.97	0.01	0.00	183.11
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	4.13478 / 0.45942					7.02	0.13	0.00	10.69
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	0.887147 / 0.543735					1.96	0.03	0.00	2.75
Single Family Housing	172.919 / 109.014					385.13	5.30	0.14	538.96
Strip Mall	30.8638 / 18.9165					68.19	0.95	0.02	95.64
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,247.69**	**11.38**	**0.29**	**1,580.05**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					1,119.53	66.16	0.00	2,508.93
Unmitigated					1,119.53	66.16	0.00	2,508.93
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	607.2					123.26	7.28	0.00	276.22
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Hotel	89.24					18.11	1.07	0.00	40.60
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	3167.27					642.93	38.00	0.00	1,440.84
Strip Mall	437.5					88.81	5.25	0.00	199.03
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,119.55**	**66.17**	**0.00**	**2,508.94**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	607.2					123.26	7.28	0.00	276.22
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	15.55					3.16	0.19	0.00	7.07
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	139.5					28.32	1.67	0.00	63.46
High School	260					52.78	3.12	0.00	118.28
Hotel	89.24					18.11	1.07	0.00	40.60
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	85.5					17.36	1.03	0.00	38.90
Single Family Housing	3167.27					642.93	38.00	0.00	1,440.84
Strip Mall	437.5					88.81	5.25	0.00	199.03
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,119.55**	**66.17**	**0.00**	**2,508.94**

9.0 Vegetation

River Islands Operation - Proposed Project 2033

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	20	User Defined Unit
Elementary School	138	1000sqft
High School	200	1000sqft
Junior High School	64	1000sqft
City Park	217	Acre
Golf Course	300	Acre
Hotel	325	Room
Racquet Club	30	1000sqft
Apartments Low Rise	1495	Dwelling Unit
Apartments Mid Rise	980	Dwelling Unit
Single Family Housing	3066	Dwelling Unit
Strip Mall	833.33	1000sqft

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	2	**Precipitation Freq (Days)**	45		

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - -

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	87.34	0.26	1.88	0.00	0.25	0.02	0.27	0.00	0.01	0.02	0.00	203.11	203.11	0.02	0.00	203.44
Total	**87.34**	**0.26**	**1.88**	**0.00**	**0.25**	**0.02**	**0.27**	**0.00**	**0.01**	**0.02**	**0.00**	**203.11**	**203.11**	**0.02**	**0.00**	**203.44**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	87.34	0.26	1.88	0.00	0.01	0.02	0.03	0.00	0.01	0.02	0.00	203.11	203.11	0.02	0.00	203.44
Total	**87.34**	**0.26**	**1.88**	**0.00**	**0.01**	**0.02**	**0.03**	**0.00**	**0.01**	**0.02**	**0.00**	**203.11**	**203.11**	**0.02**	**0.00**	**203.44**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	68.54	3.41	221.03	0.59		0.00	30.02		0.00	30.01	3,921.36	7,269.18	11,190.54	18.53	0.13	11,620.68
Energy	0.94	8.10	4.02	0.05		0.00	0.65		0.00	0.65	0.00	23,219.76	23,219.76	0.81	0.41	23,363.58
Mobile	55.40	270.40	441.93	1.50	131.39	7.80	139.20	2.44	7.03	9.47	0.00	130,043.86	130,043.86	3.20	0.00	130,111.06
Waste						0.00	0.00		0.00	0.00	1,388.81	0.00	1,388.81	82.08	0.00	3,112.41
Water						0.00	0.00		0.00	0.00	0.00	1,635.86	1,635.86	13.65	0.36	2,035.52
Total	**124.88**	**281.91**	**666.98**	**2.14**	**131.39**	**7.80**	**169.87**	**2.44**	**7.03**	**40.13**	**5,310.17**	**162,168.66**	**167,478.83**	**118.27**	**0.90**	**170,243.25**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	48.76	0.48	41.41	0.00		0.00	0.73		0.00	0.73	0.00	7,268.97	7,268.97	0.20	0.13	7,314.15
Energy	0.94	8.10	4.02	0.05		0.00	0.65		0.00	0.65	0.00	23,219.76	23,219.76	0.81	0.41	23,363.58
Mobile	55.40	270.40	441.93	1.50	131.39	7.80	139.20	2.44	7.03	9.47	0.00	130,043.86	130,043.86	3.20	0.00	130,111.06
Waste						0.00	0.00		0.00	0.00	1,388.81	0.00	1,388.81	82.08	0.00	3,112.41
Water						0.00	0.00		0.00	0.00	0.00	1,635.86	1,635.86	13.65	0.36	2,035.52
Total	**105.10**	**278.98**	**487.36**	**1.55**	**131.39**	**7.80**	**140.58**	**2.44**	**7.03**	**10.85**	**1,388.81**	**162,168.45**	**163,557.26**	**99.94**	**0.90**	**165,936.72**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	87.17					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**87.18**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.16	0.19	1.84	0.00	0.25	0.01	0.26	0.00	0.01	0.01	0.00	197.88	197.88	0.01	0.00	198.19
Total	**0.16**	**0.19**	**1.84**	**0.00**	**0.25**	**0.01**	**0.26**	**0.00**	**0.01**	**0.01**	**0.00**	**197.88**	**197.88**	**0.01**	**0.00**	**198.19**

3.2 Architectural Coating - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	87.17					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**87.18**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.16	0.19	1.84	0.00	0.01	0.01	0.02	0.00	0.01	0.01	0.00	197.88	197.88	0.01	0.00	198.19
Total	**0.16**	**0.19**	**1.84**	**0.00**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.01**	**0.00**	**197.88**	**197.88**	**0.01**	**0.00**	**198.19**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	55.40	270.40	441.93	1.50	131.39	7.80	139.20	2.44	7.03	9.47	0.00	130,043.86	130,043.86	3.20	0.00	130,111.06
Unmitigated	55.40	270.40	441.93	1.50	131.39	7.80	139.20	2.44	7.03	9.47	0.00	130,043.86	130,043.86	3.20	0.00	130,111.06
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	9,852.05	10,704.20	9074.65	37,627,784	37,627,784
Apartments Mid Rise	6,458.20	7,016.80	5948.60	24,665,705	24,665,705
City Park	345.03	345.03	345.03	850,915	850,915
Elementary School	2,129.34	0.00	0.00	4,555,538	4,555,538
Golf Course	1,512.00	1,746.00	1764.00	3,301,340	3,301,340
High School	2,578.00	874.00	358.00	7,560,208	7,560,208
Hotel	2,655.25	2,661.75	1933.75	5,129,624	5,129,624
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	987.90	626.10	801.90	1,542,874	1,542,874
Single Family Housing	29,341.62	30,905.28	26888.82	111,458,067	111,458,067
Strip Mall	36,933.19	35,033.19	17024.93	53,972,033	53,972,033

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Commercial	110.40	110.40	110.40	245,333	245,333
Total	93,784.90	90,022.75	64,250.08	252,896,535	252,896,535

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
High School	14.70	6.60	6.60	77.80	17.20	5.00
Hotel	14.70	6.60	6.60	19.40	61.60	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
Strip Mall	14.70	6.60	6.60	16.60	64.40	19.00
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	13,931.49	13,931.49	0.63	0.24	14,018.79
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	13,931.49	13,931.49	0.63	0.24	14,018.79
NaturalGas Mitigated	0.94	8.10	4.02	0.05		0.00	0.65		0.00	0.65	0.00	9,288.27	9,288.27	0.18	0.17	9,344.79
NaturalGas Unmitigated	0.94	8.10	4.02	0.05		0.00	0.65		0.00	0.65	0.00	9,288.27	9,288.27	0.18	0.17	9,344.79
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.13904e+007	0.12	0.99	0.42	0.01		0.00	0.08		0.00	0.08	0.00	1,141.47	1,141.47	0.02	0.02	1,148.42
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	1.32651e+007	0.07	0.65	0.55	0.00		0.00	0.05		0.00	0.05	0.00	707.88	707.88	0.01	0.01	712.18
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.11448e+008	0.60	5.14	2.19	0.03		0.00	0.42		0.00	0.42	0.00	5,947.29	5,947.29	0.11	0.11	5,983.49
Strip Mall	1.02416e+007	0.06	0.50	0.42	0.00		0.00	0.04		0.00	0.04	0.00	546.53	546.53	0.01	0.01	549.86
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.94**	**8.11**	**4.03**	**0.04**		**0.00**	**0.66**		**0.00**	**0.66**	**0.00**	**9,288.27**	**9,288.27**	**0.16**	**0.16**	**9,344.79**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.13904e+007	0.12	0.99	0.42	0.01		0.00	0.08		0.00	0.08	0.00	1,141.47	1,141.47	0.02	0.02	1,148.42
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.37172e+006	0.01	0.07	0.06	0.00		0.00	0.01		0.00	0.01	0.00	73.20	73.20	0.00	0.00	73.65
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	1.32651e+007	0.07	0.65	0.55	0.00		0.00	0.05		0.00	0.05	0.00	707.88	707.88	0.01	0.01	712.18
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.11448e+008	0.60	5.14	2.19	0.03		0.00	0.42		0.00	0.42	0.00	5,947.29	5,947.29	0.11	0.11	5,983.49
Strip Mall	1.02416e+007	0.06	0.50	0.42	0.00		0.00	0.04		0.00	0.04	0.00	546.53	546.53	0.01	0.01	549.86
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.94**	**8.11**	**4.03**	**0.04**		**0.00**	**0.66**		**0.00**	**0.66**	**0.00**	**9,288.27**	**9,288.27**	**0.16**	**0.16**	**9,344.79**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	5.7189e+006					1,663.69	0.08	0.03	1,674.12
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	3.54869e+006					1,032.35	0.05	0.02	1,038.82
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	2.10162e+007					6,113.85	0.28	0.10	6,152.16
Strip Mall	1.11583e+007					3,246.07	0.15	0.06	3,266.42
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**13,931.48**	**0.65**	**0.24**	**14,018.79**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	5.7189e+006					1,663.69	0.08	0.03	1,674.12
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	885960					257.74	0.01	0.00	259.35
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	3.54869e+006					1,032.35	0.05	0.02	1,038.82
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	2.10162e+007					6,113.85	0.28	0.10	6,152.16
Strip Mall	1.11583e+007					3,246.07	0.15	0.06	3,266.42
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**13,931.48**	**0.65**	**0.24**	**14,018.79**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	48.76	0.48	41.41	0.00		0.00	0.73		0.00	0.73	0.00	7,268.97	7,268.97	0.20	0.13	7,314.15
Unmitigated	68.54	3.41	221.03	0.59		0.00	30.02		0.00	30.01	3,921.36	7,269.18	11,190.54	18.53	0.13	11,620.68
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	8.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	38.08					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	20.50	2.93	179.56	0.59		0.00	29.79		0.00	29.78	3,921.36	7,201.21	11,122.57	18.47	0.13	11,551.36
Landscaping	1.24	0.48	41.47	0.00		0.00	0.23		0.00	0.23	0.00	67.97	67.97	0.06	0.00	69.33
Total	**68.54**	**3.41**	**221.03**	**0.59**		**0.00**	**30.02**		**0.00**	**30.01**	**3,921.36**	**7,269.18**	**11,190.54**	**18.53**	**0.13**	**11,620.69**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	8.72					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	38.08					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.73	0.00	0.04	0.00		0.00	0.50		0.00	0.50	0.00	7,201.21	7,201.21	0.14	0.13	7,245.03
Landscaping	1.23	0.48	41.38	0.00		0.00	0.23		0.00	0.23	0.00	67.77	67.77	0.06	0.00	69.12
Total	**48.76**	**0.48**	**41.42**	**0.00**		**0.00**	**0.73**		**0.00**	**0.73**	**0.00**	**7,268.98**	**7,268.98**	**0.20**	**0.13**	**7,314.15**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					1,635.86	13.65	0.36	2,035.52
Unmitigated					1,635.86	13.65	0.36	2,035.52
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	97.4053 / 61.4077					216.94	2.98	0.08	303.59
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	8.2442 / 0.916022					14.00	0.25	0.01	21.31
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	199.762 / 125.937					444.92	6.12	0.16	622.62
Strip Mall	61.7269 / 37.8326					136.38	1.89	0.05	191.28
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,635.86**	**13.64**	**0.37**	**2,035.52**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	97.4053 / 61.4077					216.94	2.98	0.08	303.59
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	4.00157 / 10.2898					16.82	0.12	0.00	20.43
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	8.2442 / 0.916022					14.00	0.25	0.01	21.31
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	199.762 / 125.937					444.92	6.12	0.16	622.62
Strip Mall	61.7269 / 37.8326					136.38	1.89	0.05	191.28
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,635.86**	**13.64**	**0.37**	**2,035.52**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					1,388.81	82.08	0.00	3,112.41
Unmitigated					1,388.81	82.08	0.00	3,112.41
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	687.7					139.60	8.25	0.00	312.85
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	279					56.63	3.35	0.00	126.92
High School	260					52.78	3.12	0.00	118.28
Hotel	177.94					36.12	2.13	0.00	80.95
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	3659.03					742.75	43.90	0.00	1,664.55
Strip Mall	875					177.62	10.50	0.00	398.05
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,388.82**	**82.08**	**0.00**	**3,112.42**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	687.7					139.60	8.25	0.00	312.85
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	179.4					36.42	2.15	0.00	81.61
Golf Course	279					56.63	3.35	0.00	126.92
High School	260					52.78	3.12	0.00	118.28
Hotel	177.94					36.12	2.13	0.00	80.95
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	3659.03					742.75	43.90	0.00	1,664.55
Strip Mall	875					177.62	10.50	0.00	398.05
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,388.82**	**82.08**	**0.00**	**3,112.42**

9.0 Vegetation

River Islands Operation - Proposed Project 2034

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	20	User Defined Unit
Elementary School	184	1000sqft
High School	200	1000sqft
Junior High School	64	1000sqft
City Park	217	Acre
Golf Course	300	Acre
Hotel	488	Room
Racquet Club	30	1000sqft
Apartments Low Rise	1670	Dwelling Unit
Apartments Mid Rise	980	Dwelling Unit
Single Family Housing	3479	Dwelling Unit
Strip Mall	1250	1000sqft

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	2	**Precipitation Freq (Days)**	45		

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - -

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	100.84	0.28	2.15	0.00	0.29	0.02	0.31	0.00	0.02	0.02	0.00	232.45	232.45	0.02	0.00	232.83
Total	**100.84**	**0.28**	**2.15**	**0.00**	**0.29**	**0.02**	**0.31**	**0.00**	**0.02**	**0.02**	**0.00**	**232.45**	**232.45**	**0.02**	**0.00**	**232.83**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	100.84	0.28	2.15	0.00	0.01	0.02	0.03	0.00	0.02	0.02	0.00	232.45	232.45	0.02	0.00	232.83
Total	**100.84**	**0.28**	**2.15**	**0.00**	**0.01**	**0.02**	**0.03**	**0.00**	**0.02**	**0.02**	**0.00**	**232.45**	**232.45**	**0.02**	**0.00**	**232.83**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	76.41	3.46	225.44	0.59		0.00	30.10		0.00	30.09	3,921.36	8,040.57	11,961.93	18.56	0.15	12,396.87
Energy	1.10	9.51	4.87	0.06		0.00	0.76		0.00	0.76	0.00	28,052.22	28,052.22	0.99	0.49	28,226.05
Mobile	67.82	334.76	539.13	1.80	157.63	9.39	167.02	2.92	8.46	11.38	0.00	156,549.99	156,549.99	3.88	0.00	156,631.48
Waste						0.00	0.00		0.00	0.00	1,624.26	0.00	1,624.26	95.99	0.00	3,640.08
Water						0.00	0.00		0.00	0.00	0.00	1,802.01	1,802.01	15.93	0.42	2,268.07
Total	**145.33**	**347.73**	**769.44**	**2.45**	**157.63**	**9.39**	**197.88**	**2.92**	**8.46**	**42.23**	**5,545.62**	**194,444.79**	**199,990.41**	**135.35**	**1.06**	**203,162.55**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	56.63	0.53	45.81	0.00		0.00	0.81		0.00	0.80	0.00	8,040.34	8,040.34	0.22	0.15	8,090.31
Energy	1.10	9.51	4.87	0.06		0.00	0.76		0.00	0.76	0.00	28,052.22	28,052.22	0.99	0.49	28,226.05
Mobile	67.82	334.76	539.13	1.80	157.63	9.39	167.02	2.92	8.46	11.38	0.00	156,549.9 9	156,549.9 9	3.88	0.00	156,631.4 8
Waste						0.00	0.00		0.00	0.00	1,624.26	0.00	1,624.26	95.99	0.00	3,640.08
Water						0.00	0.00		0.00	0.00	0.00	1,802.01	1,802.01	15.93	0.42	2,268.07
Total	**125.55**	**344.80**	**589.81**	**1.86**	**157.63**	**9.39**	**168.59**	**2.92**	**8.46**	**12.94**	**1,624.26**	**194,444.5 6**	**196,068.8 2**	**117.01**	**1.06**	**198,855.9 9**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	100.64					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**100.65**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.18	0.21	2.11	0.00	0.29	0.01	0.30	0.00	0.01	0.01	0.00	227.23	227.23	0.02	0.00	227.58
Total	**0.18**	**0.21**	**2.11**	**0.00**	**0.29**	**0.01**	**0.30**	**0.00**	**0.01**	**0.01**	**0.00**	**227.23**	**227.23**	**0.02**	**0.00**	**227.58**

3.2 Architectural Coating - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	100.64					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**100.65**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.18	0.21	2.11	0.00	0.01	0.01	0.02	0.00	0.01	0.01	0.00	227.23	227.23	0.02	0.00	227.58
Total	**0.18**	**0.21**	**2.11**	**0.00**	**0.01**	**0.01**	**0.02**	**0.00**	**0.01**	**0.01**	**0.00**	**227.23**	**227.23**	**0.02**	**0.00**	**227.58**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	67.82	334.76	539.13	1.80	157.63	9.39	167.02	2.92	8.46	11.38	0.00	156,549.99	156,549.99	3.88	0.00	156,631.48
Unmitigated	67.82	334.76	539.13	1.80	157.63	9.39	167.02	2.92	8.46	11.38	0.00	156,549.99	156,549.99	3.88	0.00	156,631.48
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	11,005.30	11,957.20	10136.90	42,032,374	42,032,374
Apartments Mid Rise	6,458.20	7,016.80	5948.60	24,665,705	24,665,705
City Park	345.03	345.03	345.03	850,915	850,915
Elementary School	2,839.12	0.00	0.00	6,074,051	6,074,051
Golf Course	1,512.00	1,746.00	1764.00	3,301,340	3,301,340
High School	2,578.00	874.00	358.00	7,560,208	7,560,208
Hotel	3,986.96	3,996.72	2903.60	7,702,327	7,702,327
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	987.90	626.10	801.90	1,542,874	1,542,874
Single Family Housing	33,294.03	35,068.32	30510.83	126,471,825	126,471,825
Strip Mall	55,400.00	52,550.00	25537.50	80,958,373	80,958,373

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Commercial	110.40	110.40	110.40	245,333	245,333
Total	119,398.86	114,290.57	78,416.76	303,392,440	303,392,440

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
High School	14.70	6.60	6.60	77.80	17.20	5.00
Hotel	14.70	6.60	6.60	19.40	61.60	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
Strip Mall	14.70	6.60	6.60	16.60	64.40	19.00
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	17,176.52	17,176.52	0.78	0.29	17,284.16
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	17,176.52	17,176.52	0.78	0.29	17,284.16
NaturalGas Mitigated	1.10	9.51	4.87	0.06		0.00	0.76		0.00	0.76	0.00	10,875.70	10,875.70	0.21	0.20	10,941.89
NaturalGas Unmitigated	1.10	9.51	4.87	0.06		0.00	0.76		0.00	0.76	0.00	10,875.70	10,875.70	0.21	0.20	10,941.89
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.38942e+007	0.13	1.10	0.47	0.01		0.00	0.09		0.00	0.09	0.00	1,275.09	1,275.09	0.02	0.02	1,282.85
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.82896e+006	0.01	0.09	0.08	0.00		0.00	0.01		0.00	0.01	0.00	97.60	97.60	0.00	0.00	98.19
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	1.99181e+007	0.11	0.98	0.82	0.01		0.00	0.07		0.00	0.07	0.00	1,062.90	1,062.90	0.02	0.02	1,069.37
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.2646e+008	0.68	5.83	2.48	0.04		0.00	0.47		0.00	0.47	0.00	6,748.41	6,748.41	0.13	0.12	6,789.48
Strip Mall	1.53625e+007	0.08	0.75	0.63	0.00		0.00	0.06		0.00	0.06	0.00	819.80	819.80	0.02	0.02	824.79
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**1.09**	**9.51**	**4.87**	**0.06**		**0.00**	**0.76**		**0.00**	**0.76**	**0.00**	**10,875.70**	**10,875.70**	**0.20**	**0.19**	**10,941.87**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.38942e+007	0.13	1.10	0.47	0.01		0.00	0.09		0.00	0.09	0.00	1,275.09	1,275.09	0.02	0.02	1,282.85
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.82896e+006	0.01	0.09	0.08	0.00		0.00	0.01		0.00	0.01	0.00	97.60	97.60	0.00	0.00	98.19
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	1.99181e+007	0.11	0.98	0.82	0.01		0.00	0.07		0.00	0.07	0.00	1,062.90	1,062.90	0.02	0.02	1,069.37
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.2646e+008	0.68	5.83	2.48	0.04		0.00	0.47		0.00	0.47	0.00	6,748.41	6,748.41	0.13	0.12	6,789.48
Strip Mall	1.53625e+007	0.08	0.75	0.63	0.00		0.00	0.06		0.00	0.06	0.00	819.80	819.80	0.02	0.02	824.79
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**1.09**	**9.51**	**4.87**	**0.06**		**0.00**	**0.76**		**0.00**	**0.76**	**0.00**	**10,875.70**	**10,875.70**	**0.20**	**0.19**	**10,941.87**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	6.38833e+006					1,858.44	0.08	0.03	1,870.09
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	1.18128e+006					343.65	0.02	0.01	345.80
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	5.32849e+006					1,550.12	0.07	0.03	1,559.83
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	2.38471e+007					6,937.40	0.31	0.12	6,980.87
Strip Mall	1.67375e+007					4,869.13	0.22	0.08	4,899.64
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**17,176.52**	**0.78**	**0.30**	**17,284.15**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	6.38833e+006					1,858.44	0.08	0.03	1,870.09
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	1.18128e+006					343.65	0.02	0.01	345.80
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	5.32849e+006					1,550.12	0.07	0.03	1,559.83
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	2.38471e+007					6,937.40	0.31	0.12	6,980.87
Strip Mall	1.67375e+007					4,869.13	0.22	0.08	4,899.64
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**17,176.52**	**0.78**	**0.30**	**17,284.15**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	56.63	0.53	45.81	0.00		0.00	0.81		0.00	0.80	0.00	8,040.34	8,040.34	0.22	0.15	8,090.31
Unmitigated	76.41	3.46	225.44	0.59		0.00	30.10		0.00	30.09	3,921.36	8,040.57	11,961.93	18.56	0.15	12,396.87
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	10.06					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	44.40					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	20.57	2.93	179.56	0.59		0.00	29.84		0.00	29.84	3,921.36	7,965.38	11,886.74	18.48	0.15	12,320.18
Landscaping	1.37	0.53	45.87	0.00		0.00	0.25		0.00	0.25	0.00	75.18	75.18	0.07	0.00	76.68
Total	**76.40**	**3.46**	**225.43**	**0.59**		**0.00**	**30.09**		**0.00**	**30.09**	**3,921.36**	**8,040.56**	**11,961.92**	**18.55**	**0.15**	**12,396.86**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	10.06					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	44.40					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.80	0.00	0.04	0.00		0.00	0.56		0.00	0.55	0.00	7,965.38	7,965.38	0.15	0.15	8,013.86
Landscaping	1.37	0.53	45.77	0.00		0.00	0.25		0.00	0.25	0.00	74.96	74.96	0.07	0.00	76.45
Total	**56.63**	**0.53**	**45.81**	**0.00**		**0.00**	**0.81**		**0.00**	**0.80**	**0.00**	**8,040.34**	**8,040.34**	**0.22**	**0.15**	**8,090.31**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					1,802.01	15.93	0.42	2,268.07
Unmitigated					1,802.01	15.93	0.42	2,268.07
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	108.807 / 68.5959					242.34	3.33	0.09	339.13
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	5.33543 / 13.7197					22.43	0.16	0.00	27.24
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	12.379 / 1.37544					21.03	0.38	0.01	32.00
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	226.671 / 142.901					504.85	6.94	0.18	706.49
Strip Mall	92.5907 / 56.7491					204.57	2.84	0.07	286.92
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,802.02**	**15.93**	**0.42**	**2,268.07**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	108.807 / 68.5959					242.34	3.33	0.09	339.13
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	5.33543 / 13.7197					22.43	0.16	0.00	27.24
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	12.379 / 1.37544					21.03	0.38	0.01	32.00
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	226.671 / 142.901					504.85	6.94	0.18	706.49
Strip Mall	92.5907 / 56.7491					204.57	2.84	0.07	286.92
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,802.02**	**15.93**	**0.42**	**2,268.07**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					1,624.26	95.99	0.00	3,640.08
Unmitigated					1,624.26	95.99	0.00	3,640.08
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	768.2					155.94	9.22	0.00	349.47
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	239.2					48.56	2.87	0.00	108.82
Golf Course	279					56.63	3.35	0.00	126.92
High School	260					52.78	3.12	0.00	118.28
Hotel	267.18					54.24	3.21	0.00	121.54
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	4151.92					842.80	49.81	0.00	1,888.77
Strip Mall	1312.5					266.43	15.75	0.00	597.08
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,624.28**	**96.01**	**0.00**	**3,640.09**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	768.2					155.94	9.22	0.00	349.47
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	239.2					48.56	2.87	0.00	108.82
Golf Course	279					56.63	3.35	0.00	126.92
High School	260					52.78	3.12	0.00	118.28
Hotel	267.18					54.24	3.21	0.00	121.54
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	4151.92					842.80	49.81	0.00	1,888.77
Strip Mall	1312.5					266.43	15.75	0.00	597.08
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,624.28**	**96.01**	**0.00**	**3,640.09**

9.0 Vegetation

River Islands Operation - Proposed Project 2035

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	20	User Defined Unit
Elementary School	184	1000sqft
High School	200	1000sqft
Junior High School	64	1000sqft
City Park	217	Acre
Golf Course	300	Acre
Hotel	650	Room
Racquet Club	30	1000sqft
Apartments Low Rise	1845	Dwelling Unit
Apartments Mid Rise	980	Dwelling Unit
Single Family Housing	3891	Dwelling Unit
Strip Mall	1666.67	1000sqft

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	2	**Precipitation Freq (Days)**	45		

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 10,000 sq ft

Construction Phase - -

Vehicle Trips - Fire station assumptions from URBEMIS input.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	113.98	0.31	2.41	0.00	0.33	0.02	0.34	0.01	0.02	0.02	0.00	260.68	260.68	0.02	0.00	261.10
Total	**113.98**	**0.31**	**2.41**	**0.00**	**0.33**	**0.02**	**0.34**	**0.01**	**0.02**	**0.02**	**0.00**	**260.68**	**260.68**	**0.02**	**0.00**	**261.10**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	113.98	0.31	2.41	0.00	0.01	0.02	0.03	0.01	0.02	0.02	0.00	260.68	260.68	0.02	0.00	261.10
Total	**113.98**	**0.31**	**2.41**	**0.00**	**0.01**	**0.02**	**0.03**	**0.01**	**0.02**	**0.02**	**0.00**	**260.68**	**260.68**	**0.02**	**0.00**	**261.10**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	89.96	4.38	283.46	0.76		0.00	38.92		0.00	38.91	5,092.70	8,810.64	13,903.34	24.05	0.16	14,458.06
Energy	1.26	10.89	5.69	0.07		0.00	0.87		0.00	0.87	0.00	32,765.09	32,765.09	1.16	0.58	32,968.17
Mobile	79.89	397.49	633.64	2.10	183.05	10.93	193.98	3.39	9.85	13.24	0.00	182,251.04	182,251.04	4.54	0.00	182,346.39
Waste						0.00	0.00		0.00	0.00	1,847.24	0.00	1,847.24	109.17	0.00	4,139.79
Water						0.00	0.00		0.00	0.00	0.00	1,962.36	1,962.36	18.18	0.48	2,493.53
Total	**171.11**	**412.76**	**922.79**	**2.93**	**183.05**	**10.93**	**233.77**	**3.39**	**9.85**	**53.02**	**6,939.94**	**225,789.13**	**232,729.07**	**157.10**	**1.22**	**236,405.94**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	64.28	0.58	50.20	0.00		0.00	0.89		0.00	0.88	0.00	8,810.40	8,810.40	0.25	0.16	8,865.16
Energy	1.26	10.89	5.69	0.07		0.00	0.87		0.00	0.87	0.00	32,765.09	32,765.09	1.16	0.58	32,968.17
Mobile	79.89	397.49	633.64	2.10	183.05	10.93	193.98	3.39	9.85	13.24	0.00	182,251.04	182,251.04	4.54	0.00	182,346.39
Waste						0.00	0.00		0.00	0.00	1,847.24	0.00	1,847.24	109.17	0.00	4,139.79
Water						0.00	0.00		0.00	0.00	0.00	1,962.36	1,962.36	18.18	0.48	2,493.53
Total	**145.43**	**408.96**	**689.53**	**2.17**	**183.05**	**10.93**	**195.74**	**3.39**	**9.85**	**14.99**	**1,847.24**	**225,788.89**	**227,636.13**	**133.30**	**1.22**	**230,813.04**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	113.77					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**113.78**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.21	0.24	2.37	0.00	0.33	0.01	0.34	0.01	0.01	0.02	0.00	255.46	255.46	0.02	0.00	255.86
Total	**0.21**	**0.24**	**2.37**	**0.00**	**0.33**	**0.01**	**0.34**	**0.01**	**0.01**	**0.02**	**0.00**	**255.46**	**255.46**	**0.02**	**0.00**	**255.86**

3.2 Architectural Coating - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	113.77					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.07	0.04	0.00		0.01	0.01		0.01	0.01	0.00	5.23	5.23	0.00	0.00	5.25
Total	**113.78**	**0.07**	**0.04**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**5.23**	**5.23**	**0.00**	**0.00**	**5.25**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.21	0.24	2.37	0.00	0.01	0.01	0.03	0.01	0.01	0.02	0.00	255.46	255.46	0.02	0.00	255.86
Total	**0.21**	**0.24**	**2.37**	**0.00**	**0.01**	**0.01**	**0.03**	**0.01**	**0.01**	**0.02**	**0.00**	**255.46**	**255.46**	**0.02**	**0.00**	**255.86**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	79.89	397.49	633.64	2.10	183.05	10.93	193.98	3.39	9.85	13.24	0.00	182,251.04	182,251.04	4.54	0.00	182,346.39
Unmitigated	79.89	397.49	633.64	2.10	183.05	10.93	193.98	3.39	9.85	13.24	0.00	182,251.04	182,251.04	4.54	0.00	182,346.39
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	12,158.55	13,210.20	11199.15	46,436,964	46,436,964
Apartments Mid Rise	6,458.20	7,016.80	5948.60	24,665,705	24,665,705
City Park	345.03	345.03	345.03	850,915	850,915
Elementary School	2,839.12	0.00	0.00	6,074,051	6,074,051
Golf Course	1,512.00	1,746.00	1764.00	3,301,340	3,301,340
High School	2,578.00	874.00	358.00	7,560,208	7,560,208
Hotel	5,310.50	5,323.50	3867.50	10,259,247	10,259,247
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	987.90	626.10	801.90	1,542,874	1,542,874
Single Family Housing	37,236.87	39,221.28	34124.07	141,449,230	141,449,230
Strip Mall	73,866.81	70,066.81	34050.07	107,944,714	107,944,714

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Commercial	110.40	110.40	110.40	245,333	245,333
Total	144,285.30	138,540.12	92,568.72	352,317,695	352,317,695

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
High School	14.70	6.60	6.60	77.80	17.20	5.00
Hotel	14.70	6.60	6.60	19.40	61.60	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
Strip Mall	14.70	6.60	6.60	16.60	64.40	19.00
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	20,330.47	20,330.47	0.92	0.35	20,457.88
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	20,330.47	20,330.47	0.92	0.35	20,457.88
NaturalGas Mitigated	1.26	10.89	5.69	0.07		0.00	0.87		0.00	0.87	0.00	12,434.62	12,434.62	0.24	0.23	12,510.29
NaturalGas Unmitigated	1.26	10.89	5.69	0.07		0.00	0.87		0.00	0.87	0.00	12,434.62	12,434.62	0.24	0.23	12,510.29
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.63981e+007	0.14	1.22	0.52	0.01		0.00	0.10		0.00	0.10	0.00	1,408.70	1,408.70	0.03	0.03	1,417.28
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.82896e+006	0.01	0.09	0.08	0.00		0.00	0.01		0.00	0.01	0.00	97.60	97.60	0.00	0.00	98.19
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	2.65302e+007	0.14	1.30	1.09	0.01		0.00	0.10		0.00	0.10	0.00	1,415.75	1,415.75	0.03	0.03	1,424.37
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.41437e+008	0.76	6.52	2.77	0.04		0.00	0.53		0.00	0.53	0.00	7,547.59	7,547.59	0.14	0.14	7,593.53
Strip Mall	2.04834e+007	0.11	1.00	0.84	0.01		0.00	0.08		0.00	0.08	0.00	1,093.07	1,093.07	0.02	0.02	1,099.72
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**1.24**	**10.89**	**5.69**	**0.07**		**0.00**	**0.88**		**0.00**	**0.88**	**0.00**	**12,434.61**	**12,434.61**	**0.23**	**0.23**	**12,510.28**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.63981e+007	0.14	1.22	0.52	0.01		0.00	0.10		0.00	0.10	0.00	1,408.70	1,408.70	0.03	0.03	1,417.28
Apartments Mid Rise	1.31262e+007	0.07	0.60	0.26	0.00		0.00	0.05		0.00	0.05	0.00	700.47	700.47	0.01	0.01	704.73
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.82896e+006	0.01	0.09	0.08	0.00		0.00	0.01		0.00	0.01	0.00	97.60	97.60	0.00	0.00	98.19
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	1.988e+006	0.01	0.10	0.08	0.00		0.00	0.01		0.00	0.01	0.00	106.09	106.09	0.00	0.00	106.73
Hotel	2.65302e+007	0.14	1.30	1.09	0.01		0.00	0.10		0.00	0.10	0.00	1,415.75	1,415.75	0.03	0.03	1,424.37
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.41437e+008	0.76	6.52	2.77	0.04		0.00	0.53		0.00	0.53	0.00	7,547.59	7,547.59	0.14	0.14	7,593.53
Strip Mall	2.04834e+007	0.11	1.00	0.84	0.01		0.00	0.08		0.00	0.08	0.00	1,093.07	1,093.07	0.02	0.02	1,099.72
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**1.24**	**10.89**	**5.69**	**0.07**		**0.00**	**0.88**		**0.00**	**0.88**	**0.00**	**12,434.61**	**12,434.61**	**0.23**	**0.23**	**12,510.28**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	7.05777e+006					2,053.19	0.09	0.04	2,066.05
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	1.18128e+006					343.65	0.02	0.01	345.80
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	7.09738e+006					2,064.71	0.09	0.04	2,077.65
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	2.66712e+007					7,758.96	0.35	0.13	7,807.58
Strip Mall	2.23167e+007					6,492.19	0.29	0.11	6,532.87
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**20,330.48**	**0.92**	**0.36**	**20,457.87**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	7.05777e+006					2,053.19	0.09	0.04	2,066.05
Apartments Mid Rise	3.58931e+006					1,044.17	0.05	0.02	1,050.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	1.18128e+006					343.65	0.02	0.01	345.80
Golf Course	0					0.00	0.00	0.00	0.00
High School	1.284e+006					373.53	0.02	0.01	375.87
Hotel	7.09738e+006					2,064.71	0.09	0.04	2,077.65
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	2.66712e+007					7,758.96	0.35	0.13	7,807.58
Strip Mall	2.23167e+007					6,492.19	0.29	0.11	6,532.87
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**20,330.48**	**0.92**	**0.36**	**20,457.87**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	64.28	0.58	50.20	0.00		0.00	0.89		0.00	0.88	0.00	8,810.40	8,810.40	0.25	0.16	8,865.16
Unmitigated	89.96	4.38	283.46	0.76		0.00	38.92		0.00	38.91	5,092.70	8,810.64	13,903.34	24.05	0.16	14,458.06
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	11.38					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	50.53					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	26.55	3.80	233.19	0.76		0.00	38.64		0.00	38.64	5,092.70	8,728.26	13,820.96	23.97	0.16	14,374.03
Landscaping	1.50	0.58	50.27	0.00		0.00	0.28		0.00	0.28	0.00	82.38	82.38	0.08	0.00	84.03
Total	**89.96**	**4.38**	**283.46**	**0.76**		**0.00**	**38.92**		**0.00**	**38.92**	**5,092.70**	**8,810.64**	**13,903.34**	**24.05**	**0.16**	**14,458.06**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	11.38					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	50.53					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.88	0.00	0.05	0.00		0.00	0.61		0.00	0.60	0.00	8,728.26	8,728.26	0.17	0.16	8,781.38
Landscaping	1.50	0.58	50.15	0.00		0.00	0.28		0.00	0.28	0.00	82.14	82.14	0.08	0.00	83.78
Total	**64.29**	**0.58**	**50.20**	**0.00**		**0.00**	**0.89**		**0.00**	**0.88**	**0.00**	**8,810.40**	**8,810.40**	**0.25**	**0.16**	**8,865.16**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					1,962.36	18.18	0.48	2,493.53
Unmitigated					1,962.36	18.18	0.48	2,493.53
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	120.209 / 75.784					267.73	3.68	0.10	374.67
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	5.33543 / 13.7197					22.43	0.16	0.00	27.24
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	16.4884 / 1.83204					28.01	0.50	0.01	42.62
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	253.514 / 159.824					564.64	7.76	0.20	790.16
Strip Mall	123.454 / 75.6656					272.76	3.78	0.10	382.57
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,962.37**	**18.16**	**0.48**	**2,493.55**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	120.209 / 75.784					267.73	3.68	0.10	374.67
Apartments Mid Rise	63.8509 / 40.2539					142.21	1.96	0.05	199.01
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	5.33543 / 13.7197					22.43	0.16	0.00	27.24
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
High School	6.64093 / 17.0767					27.92	0.20	0.01	33.91
Hotel	16.4884 / 1.83204					28.01	0.50	0.01	42.62
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	253.514 / 159.824					564.64	7.76	0.20	790.16
Strip Mall	123.454 / 75.6656					272.76	3.78	0.10	382.57
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,962.37**	**18.16**	**0.48**	**2,493.55**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					1,847.24	109.17	0.00	4,139.79
Unmitigated					1,847.24	109.17	0.00	4,139.79
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	848.7					172.28	10.18	0.00	386.09
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	239.2					48.56	2.87	0.00	108.82
Golf Course	279					56.63	3.35	0.00	126.92
High School	260					52.78	3.12	0.00	118.28
Hotel	355.88					72.24	4.27	0.00	161.90
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	4643.68					942.63	55.71	0.00	2,112.48
Strip Mall	1750					355.23	20.99	0.00	796.10
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,847.25**	**109.17**	**0.00**	**4,139.80**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	848.7					172.28	10.18	0.00	386.09
Apartments Mid Rise	450.8					91.51	5.41	0.00	205.08
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	239.2					48.56	2.87	0.00	108.82
Golf Course	279					56.63	3.35	0.00	126.92
High School	260					52.78	3.12	0.00	118.28
Hotel	355.88					72.24	4.27	0.00	161.90
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	4643.68					942.63	55.71	0.00	2,112.48
Strip Mall	1750					355.23	20.99	0.00	796.10
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,847.25**	**109.17**	**0.00**	**4,139.80**

9.0 Vegetation

River Islands Operation - Alt 1b 2035

San Joaquin Valley Unified APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Commercial	20	User Defined Unit
Elementary School	184	1000sqft
High School	200	
Junior High School	64	1000sqft
City Park	217	Acre
Golf Course	300	Acre
Hotel	650	Room
Racquet Club	30	1000sqft
Apartments Low Rise	1845	Dwelling Unit
Apartments Mid Rise	287	Dwelling Unit
Single Family Housing	4584	Dwelling Unit
Strip Mall	1666.67	1000sqft

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	2	**Precipitation Freq (Days)**	45		

1.3 User Entered Comments

Project Characteristics -

Land Use - User Defined = Fire Station, 20,000 sq ft

Construction Phase - Operations only

Vehicle Trips - Fire station assumptions from URBEMIS input.

Woodstoves - No woodstove per SJVAPCD regulation

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2011	0.01	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	3.51	0.00	0.00	3.52
Total	**0.01**	**0.04**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.51**	**3.51**	**0.00**	**0.00**	**3.52**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	66.05	0.58	50.27	0.00		0.00	0.89		0.00	0.88	0.00	8,810.64	8,810.64	0.25	0.16	8,865.41
Energy	1.33	11.53	5.92	0.07		0.00	0.92		0.00	0.92	0.00	33,777.91	33,777.91	1.18	0.59	33,987.20
Mobile	72.01	373.22	579.49	2.09	183.12	10.16	193.29	3.39	9.63	13.02	0.00	179,189.86	179,189.86	4.27	0.00	179,279.62
Waste						0.00	0.00		0.00	0.00	1,897.63	0.00	1,897.63	112.15	0.00	4,252.70
Water						0.00	0.00		0.00	0.00	0.00	1,934.44	1,934.44	17.97	0.48	2,459.63
Total	**139.39**	**385.33**	**635.68**	**2.16**	**183.12**	**10.16**	**195.10**	**3.39**	**9.63**	**14.82**	**1,897.63**	**223,712.85**	**225,610.48**	**135.82**	**1.23**	**228,844.56**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	66.04	0.58	50.15	0.00		0.00	0.89		0.00	0.88	0.00	8,810.40	8,810.40	0.25	0.16	8,865.16
Energy	1.33	11.53	5.92	0.07		0.00	0.92		0.00	0.92	0.00	33,777.91	33,777.91	1.18	0.59	33,987.20
Mobile	72.01	373.22	579.49	2.09	183.12	10.16	193.29	3.39	9.63	13.02	0.00	179,189.86	179,189.86	4.27	0.00	179,279.62
Waste						0.00	0.00		0.00	0.00	1,897.63	0.00	1,897.63	112.15	0.00	4,252.70
Water						0.00	0.00		0.00	0.00	0.00	1,934.44	1,934.44	17.97	0.48	2,459.63
Total	**139.38**	**385.33**	**635.56**	**2.16**	**183.12**	**10.16**	**195.10**	**3.39**	**9.63**	**14.82**	**1,897.63**	**223,712.61**	**225,610.24**	**135.82**	**1.23**	**228,844.31**

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2011

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

3.2 Demolition - 2011

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.00	0.04	0.02	0.00		0.00	0.00		0.00	0.00	0.00	3.41	3.41	0.00	0.00	3.41
Total	**0.00**	**0.04**	**0.02**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**3.41**	**3.41**	**0.00**	**0.00**	**3.41**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.10**

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	72.01	373.22	579.49	2.09	183.12	10.16	193.29	3.39	9.63	13.02	0.00	179,189.86	179,189.86	4.27	0.00	179,279.62
Unmitigated	72.01	373.22	579.49	2.09	183.12	10.16	193.29	3.39	9.63	13.02	0.00	179,189.86	179,189.86	4.27	0.00	179,279.62
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	12,158.55	13,210.20	11199.15	46,436,964	46,436,964
Apartments Mid Rise	1,891.33	2,054.92	1742.09	7,223,528	7,223,528
City Park	345.03	345.03	345.03	850,915	850,915
Elementary School	2,839.12	0.00	0.00	6,074,051	6,074,051
Golf Course	1,512.00	1,746.00	1764.00	3,301,340	3,301,340
Hotel	5,310.50	5,323.50	3867.50	10,259,247	10,259,247
Junior High School	881.92	0.00	0.00	1,987,115	1,987,115
Racquet Club	987.90	626.10	801.90	1,542,874	1,542,874
Single Family Housing	43,868.88	46,206.72	40201.68	166,641,807	166,641,807
Strip Mall	73,866.81	70,066.81	34050.07	107,944,714	107,944,714
User Defined Commercial	110.40	110.40	110.40	245,333	245,333
Total	143,772.44	139,689.68	94,081.82	352,507,888	352,507,888

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
Apartments Low Rise	16.80	7.10	7.90	45.60	19.00	35.40
Apartments Mid Rise	16.80	7.10	7.90	45.60	19.00	35.40
City Park	14.70	6.60	6.60	33.00	48.00	19.00
Elementary School	14.70	6.60	6.60	65.00	30.00	5.00
Golf Course	14.70	6.60	6.60	33.00	48.00	19.00
Hotel	14.70	6.60	6.60	19.40	61.60	19.00
Junior High School	14.70	6.60	6.60	72.80	22.20	5.00
Racquet Club	14.70	6.60	6.60	11.50	69.50	19.00
Single Family Housing	16.80	7.10	7.90	45.60	19.00	35.40
Strip Mall	14.70	6.60	6.60	16.60	64.40	19.00
User Defined Commercial	14.70	6.60	6.60	0.00	100.00	0.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	20,600.46	20,600.46	0.93	0.35	20,729.56
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	20,600.46	20,600.46	0.93	0.35	20,729.56
NaturalGas Mitigated	1.33	11.53	5.92	0.07		0.00	0.92		0.00	0.92	0.00	13,177.45	13,177.45	0.25	0.24	13,257.65
NaturalGas Unmitigated	1.33	11.53	5.92	0.07		0.00	0.92		0.00	0.92	0.00	13,177.45	13,177.45	0.25	0.24	13,257.65
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.63981e+007	0.14	1.22	0.52	0.01		0.00	0.10		0.00	0.10	0.00	1,408.70	1,408.70	0.03	0.03	1,417.28
Apartments Mid Rise	3.84411e+006	0.02	0.18	0.08	0.00		0.00	0.01		0.00	0.01	0.00	205.14	205.14	0.00	0.00	206.38
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.82896e+006	0.01	0.09	0.08	0.00		0.00	0.01		0.00	0.01	0.00	97.60	97.60	0.00	0.00	98.19
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hotel	2.65302e+007	0.14	1.30	1.09	0.01		0.00	0.10		0.00	0.10	0.00	1,415.75	1,415.75	0.03	0.03	1,424.37
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.66627e+008	0.90	7.68	3.27	0.05		0.00	0.62		0.00	0.62	0.00	8,891.84	8,891.84	0.17	0.16	8,945.96
Strip Mall	2.04834e+007	0.11	1.00	0.84	0.01		0.00	0.08		0.00	0.08	0.00	1,093.07	1,093.07	0.02	0.02	1,099.72
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**1.32**	**11.53**	**5.93**	**0.08**		**0.00**	**0.92**		**0.00**	**0.92**	**0.00**	**13,177.44**	**13,177.44**	**0.25**	**0.24**	**13,257.63**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
Apartments Low Rise	2.63981e+007	0.14	1.22	0.52	0.01		0.00	0.10		0.00	0.10	0.00	1,408.70	1,408.70	0.03	0.03	1,417.28
Apartments Mid Rise	3.84411e+006	0.02	0.18	0.08	0.00		0.00	0.01		0.00	0.01	0.00	205.14	205.14	0.00	0.00	206.38
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elementary School	1.82896e+006	0.01	0.09	0.08	0.00		0.00	0.01		0.00	0.01	0.00	97.60	97.60	0.00	0.00	98.19
Golf Course	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High School	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hotel	2.65302e+007	0.14	1.30	1.09	0.01		0.00	0.10		0.00	0.10	0.00	1,415.75	1,415.75	0.03	0.03	1,424.37
Junior High School	636160	0.00	0.03	0.03	0.00		0.00	0.00		0.00	0.00	0.00	33.95	33.95	0.00	0.00	34.15
Racquet Club	588300	0.00	0.03	0.02	0.00		0.00	0.00		0.00	0.00	0.00	31.39	31.39	0.00	0.00	31.58
Single Family Housing	1.66627e+008	0.90	7.68	3.27	0.05		0.00	0.62		0.00	0.62	0.00	8,891.84	8,891.84	0.17	0.16	8,945.96
Strip Mall	2.04834e+007	0.11	1.00	0.84	0.01		0.00	0.08		0.00	0.08	0.00	1,093.07	1,093.07	0.02	0.02	1,099.72
User Defined Commercial	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**1.32**	**11.53**	**5.93**	**0.08**		**0.00**	**0.92**		**0.00**	**0.92**	**0.00**	**13,177.44**	**13,177.44**	**0.25**	**0.24**	**13,257.63**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	7.05777e+006					2,053.19	0.09	0.04	2,066.05
Apartments Mid Rise	1.05115e+006					305.79	0.01	0.01	307.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	1.18128e+006					343.65	0.02	0.01	345.80
Golf Course	0					0.00	0.00	0.00	0.00
High School	0					0.00	0.00	0.00	0.00
Hotel	7.09738e+006					2,064.71	0.09	0.04	2,077.65
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	3.14214e+007					9,140.86	0.41	0.16	9,198.14
Strip Mall	2.23167e+007					6,492.19	0.29	0.11	6,532.87
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**20,600.47**	**0.92**	**0.37**	**20,729.56**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
Apartments Low Rise	7.05777e+006					2,053.19	0.09	0.04	2,066.05
Apartments Mid Rise	1.05115e+006					305.79	0.01	0.01	307.71
City Park	0					0.00	0.00	0.00	0.00
Elementary School	1.18128e+006					343.65	0.02	0.01	345.80
Golf Course	0					0.00	0.00	0.00	0.00
High School	0					0.00	0.00	0.00	0.00
Hotel	7.09738e+006					2,064.71	0.09	0.04	2,077.65
Junior High School	410880					119.53	0.01	0.00	120.28
Racquet Club	276900					80.55	0.00	0.00	81.06
Single Family Housing	3.14214e+007					9,140.86	0.41	0.16	9,198.14
Strip Mall	2.23167e+007					6,492.19	0.29	0.11	6,532.87
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**20,600.47**	**0.92**	**0.37**	**20,729.56**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	66.04	0.58	50.15	0.00		0.00	0.89		0.00	0.88	0.00	8,810.40	8,810.40	0.25	0.16	8,865.16
Unmitigated	66.05	0.58	50.27	0.00		0.00	0.89		0.00	0.88	0.00	8,810.64	8,810.64	0.25	0.16	8,865.41
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	11.76					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	51.91					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.88	0.00	0.05	0.00		0.00	0.61		0.00	0.60	0.00	8,728.26	8,728.26	0.17	0.16	8,781.38
Landscaping	1.50	0.58	50.22	0.00		0.00	0.28		0.00	0.28	0.00	82.38	82.38	0.08	0.00	84.03
Total	**66.05**	**0.58**	**50.27**	**0.00**		**0.00**	**0.89**		**0.00**	**0.88**	**0.00**	**8,810.64**	**8,810.64**	**0.25**	**0.16**	**8,865.41**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	11.76					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	51.91					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hearth	0.88	0.00	0.05	0.00		0.00	0.61		0.00	0.60	0.00	8,728.26	8,728.26	0.17	0.16	8,781.38
Landscaping	1.49	0.58	50.10	0.00		0.00	0.28		0.00	0.28	0.00	82.14	82.14	0.08	0.00	83.77
Total	**66.04**	**0.58**	**50.15**	**0.00**		**0.00**	**0.89**		**0.00**	**0.88**	**0.00**	**8,810.40**	**8,810.40**	**0.25**	**0.16**	**8,865.15**

7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					1,934.44	17.97	0.48	2,459.63
Unmitigated					1,934.44	17.97	0.48	2,459.63
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	120.209 / 75.784					267.73	3.68	0.10	374.67
Apartments Mid Rise	18.6992 / 11.7886					41.65	0.57	0.01	58.28
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	5.33543 / 13.7197					22.43	0.16	0.00	27.24
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
Hotel	16.4884 / 1.83204					28.01	0.50	0.01	42.62
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	298.666 / 188.289					665.20	9.15	0.24	930.89
Strip Mall	123.454 / 75.6656					272.76	3.78	0.10	382.57
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,934.45**	**17.96**	**0.47**	**2,459.64**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
Apartments Low Rise	120.209 / 75.784					267.73	3.68	0.10	374.67
Apartments Mid Rise	18.6992 / 11.7886					41.65	0.57	0.01	58.28
City Park	0 / 258.551					263.25	0.01	0.00	264.90
Elementary School	5.33543 / 13.7197					22.43	0.16	0.00	27.24
Golf Course	0 / 357.444					363.95	0.02	0.01	366.23
Hotel	16.4884 / 1.83204					28.01	0.50	0.01	42.62
Junior High School	1.31974 / 3.39363					5.55	0.04	0.00	6.74
Racquet Club	1.77429 / 1.08747					3.92	0.05	0.00	5.50
Single Family Housing	298.666 / 188.289					665.20	9.15	0.24	930.89
Strip Mall	123.454 / 75.6656					272.76	3.78	0.10	382.57
User Defined Commercial	0 / 0					0.00	0.00	0.00	0.00
Total						**1,934.45**	**17.96**	**0.47**	**2,459.64**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					1,897.63	112.15	0.00	4,252.70
Unmitigated					1,897.63	112.15	0.00	4,252.70
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	848.7					172.28	10.18	0.00	386.09
Apartments Mid Rise	132.02					26.80	1.58	0.00	60.06
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	239.2					48.56	2.87	0.00	108.82
Golf Course	279					56.63	3.35	0.00	126.92
Hotel	355.88					72.24	4.27	0.00	161.90
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	5470.67					1,110.50	65.63	0.00	2,488.69
Strip Mall	1750					355.23	20.99	0.00	796.10
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,897.63**	**112.14**	**0.00**	**4,252.71**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
Apartments Low Rise	848.7					172.28	10.18	0.00	386.09
Apartments Mid Rise	132.02					26.80	1.58	0.00	60.06
City Park	18.66					3.79	0.22	0.00	8.49
Elementary School	239.2					48.56	2.87	0.00	108.82
Golf Course	279					56.63	3.35	0.00	126.92
Hotel	355.88					72.24	4.27	0.00	161.90
Junior High School	83.2					16.89	1.00	0.00	37.85
Racquet Club	171					34.71	2.05	0.00	77.79
Single Family Housing	5470.67					1,110.50	65.63	0.00	2,488.69
Strip Mall	1750					355.23	20.99	0.00	796.10
User Defined Commercial	0					0.00	0.00	0.00	0.00
Total						**1,897.63**	**112.14**	**0.00**	**4,252.71**

9.0 Vegetation

Appendix F-4

CALINE4 Outputs

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands Existing
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S	Z0= 100. CM	ALT= 0. (M)
BRG= WORST CASE	VD= .0 CM/S	
CLAS= 7 (G)	VS= .0 CM/S	
MIXH= 1000. M	AMB= .0 PPM	
SIGTH= 5. DEGREES	TEMP= 5.6 DEGREE (C)	

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	793	10.4	.0	13.2
B. East	990	0	0	0	AG	1118	10.4	.0	13.2
C. North	0	990	0	0	AG	374	10.4	.0	13.2
D. South	0	-990	0	0	AG	357	10.4	.0	13.2
E. Link E	2010	0	3000	0	AG	1060	10.4	.0	13.2
F. Link F	3990	0	3000	0	AG	1686	10.4	.0	13.2
G. Link G	3000	990	3000	0	AG	430	10.4	.0	13.2
H. Link H	3000	-990	3000	0	AG	570	10.4	.0	13.2
I. Link I	-3990	0	-3000	0	AG	1570	10.4	.0	13.2
J. Link J	-2010	0	-3000	0	AG	1071	10.4	.0	13.2
K. Link K	-3000	990	-3000	0	AG	460	10.4	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	679	10.4	.0	13.2
M. Link M	-990	-3000	0	-3000	AG	69	10.4	.0	13.2
N. Link N	990	-3000	0	-3000	AG	0	10.4	.0	13.2
O. Link O	0	-2010	0	-3000	AG	72	10.4	.0	13.2
P. Link P	0	-3990	0	-3000	AG	53	10.4	.0	13.2

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands Existing
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	X	Y	Z
	COORDINATES (M)		
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8
13. Recpt 13	-7	-2993	1.8
14. Recpt 14	7	-2993	1.8
15. Recpt 15	7	-3007	1.8
16. Recpt 16	-7	-3007	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands Existing
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	A	B	C	D	E	F	G	H
			CONC/LINK (PPM)							
1. Recpt 1	93.	3.2	.2	2.6	.3	.0	.0	.0	.0	.0
2. Recpt 2	93.	3.0	.0	2.9	.0	.0	.0	.0	.0	.0
3. Recpt 3	87.	3.0	.0	2.9	.0	.0	.0	.0	.0	.0
4. Recpt 4	87.	3.2	.2	2.6	.0	.2	.0	.0	.0	.0
5. Recpt 5	93.	4.2	.0	.0	.0	.0	.2	3.7	.3	.0
6. Recpt 6	267.	3.4	.0	.0	.0	.0	2.5	.4	.3	.0
7. Recpt 7	273.	3.5	.0	.0	.0	.0	2.5	.4	.0	.4
8. Recpt 8	87.	4.3	.0	.0	.0	.0	.2	3.7	.0	.4
9. Recpt 9	93.	3.4	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	267.	4.1	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	273.	4.2	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	3.5	.0	.0	.0	.0	.0	.0	.0	.0
13. Recpt 13	2.	.4	.0	.0	.0	.0	.0	.0	.0	.0
14. Recpt 14	358.	.4	.0	.0	.0	.0	.0	.0	.0	.0
15. Recpt 15	358.	.4	.0	.0	.0	.0	.0	.0	.0	.0
16. Recpt 16	2.	.5	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: River Islands Existing
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P
1. Recpt 1	.0	.0	.0	.0	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0	.0	.0	.0	.0
5. Recpt 5	.0	.0	.0	.0	.0	.0	.0	.0
6. Recpt 6	.0	.0	.0	.0	.0	.0	.0	.0
7. Recpt 7	.0	.0	.0	.0	.0	.0	.0	.0
8. Recpt 8	.0	.0	.0	.0	.0	.0	.0	.0
9. Recpt 9	.3	2.6	.3	.0	.0	.0	.0	.0
10. Recpt 10	3.5	.2	.3	.0	.0	.0	.0	.0
11. Recpt 11	3.5	.2	.0	.5	.0	.0	.0	.0
12. Recpt 12	.3	2.6	.0	.5	.0	.0	.0	.0
13. Recpt 13	.0	.0	.0	.0	.0	.0	.3	.0
14. Recpt 14	.0	.0	.0	.0	.0	.0	.3	.0
15. Recpt 15	.0	.0	.0	.0	.0	.0	.3	.0
16. Recpt 16	.0	.0	.0	.0	.0	.0	.3	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2017 Baseline External - w
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S	Z0= 100. CM	ALT=	0. (M)
BRG= WORST CASE	VD= .0 CM/S		
CLAS= 7 (G)	VS= .0 CM/S		
MIXH= 1000. M	AMB= .0 PPM		
SIGTH= 5. DEGREES	TEMP= 5.6 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	4180	4.4	.0	13.2
B. East	990	0	0	0	AG	6593	4.4	.0	13.2
C. North	0	990	0	0	AG	4078	4.4	.0	13.2
D. South	0	-990	0	0	AG	4751	4.4	.0	13.2
E. Link E	2010	0	3000	0	AG	6805	4.4	.0	13.2
F. Link F	3990	0	3000	0	AG	4274	4.4	.0	13.2
G. Link G	3000	990	3000	0	AG	1513	4.4	.0	13.2
H. Link H	3000	-990	3000	0	AG	2072	4.4	.0	13.2
I. Link I	-3990	0	-3000	0	AG	3037	4.4	.0	13.2
J. Link J	-2010	0	-3000	0	AG	3075	4.4	.0	13.2
K. Link K	-3000	990	-3000	0	AG	2028	4.4	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	4606	4.4	.0	13.2

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2017 Baseline External - w
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	6.8	.4	5.1	1.2	.0	.0	.0	.0	.0
2. Recpt 2	183.	5.9	.0	1.9	.4	3.6	.0	.0	.0	.0
3. Recpt 3	357.	5.5	.0	1.9	3.1	.4	.0	.0	.0	.0
4. Recpt 4	87.	7.0	.4	5.1	.0	1.4	.0	.0	.0	.0
5. Recpt 5	267.	6.1	.0	.0	.0	.0	5.9	.0	.0	.0
6. Recpt 6	267.	6.3	.0	.0	.0	.0	5.2	.4	.4	.0
7. Recpt 7	273.	6.5	.0	.0	.0	.0	5.2	.4	.0	.6
8. Recpt 8	273.	6.1	.0	.0	.0	.0	5.9	.0	.0	.0
9. Recpt 9	177.	4.6	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	183.	4.6	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	273.	4.0	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	4.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2017 Baseline External - w
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5.	Recpt 5	*	.0	.0	.0	.0
6.	Recpt 6	*	.0	.0	.0	.0
7.	Recpt 7	*	.0	.0	.0	.0
8.	Recpt 8	*	.0	.0	.0	.0
9.	Recpt 9	*	.9	.0	.2	3.5
10.	Recpt 10	*	.0	.9	.2	3.5
11.	Recpt 11	*	2.4	.3	.0	1.3
12.	Recpt 12	*	.3	2.5	.0	1.3

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2017 Baseline Internal - w
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 0. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 5. DEGREES TEMP= 5.6 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	2671	4.4	.0	13.2
B. East	990	0	0	0	AG	2406	4.4	.0	13.2
C. North	0	990	0	0	AG	699	4.4	.0	13.2
D. South	0	-990	0	0	AG	634	4.4	.0	13.2
E. Link E	2010	0	3000	0	AG	2967	4.4	.0	13.2
F. Link F	3990	0	3000	0	AG	2745	4.4	.0	13.2
G. Link G	3000	990	3000	0	AG	1799	4.4	.0	13.2
H. Link H	3000	-990	3000	0	AG	1121	4.4	.0	13.2
I. Link I	-3990	0	-3000	0	AG	3116	4.4	.0	13.2
J. Link J	-2010	0	-3000	0	AG	3774	4.4	.0	13.2
K. Link K	-3000	990	-3000	0	AG	251	4.4	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	881	4.4	.0	13.2

(LINK COORDINATES (M): X1, Y1, X2, Y2)

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2017 Baseline Internal - w
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	2.6	.2	2.1	.2	.0	.0	.0	.0	.0
2. Recpt 2	267.	2.7	2.2	.2	.2	.0	.0	.0	.0	.0
3. Recpt 3	273.	2.7	2.2	.2	.0	.2	.0	.0	.0	.0
4. Recpt 4	87.	2.6	.2	2.1	.0	.2	.0	.0	.0	.0
5. Recpt 5	93.	3.1	.0	.0	.0	.0	.3	2.3	.5	.0
6. Recpt 6	267.	3.3	.0	.0	.0	.0	2.4	.2	.5	.0
7. Recpt 7	273.	3.1	.0	.0	.0	.0	2.4	.2	.0	.3
8. Recpt 8	87.	2.9	.0	.0	.0	.0	.3	2.3	.0	.3
9. Recpt 9	93.	3.4	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	93.	3.4	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	87.	3.4	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	3.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2017 Baseline Internal - w
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5.	Recpt 5	*	.0	.0	.0	.0
6.	Recpt 6	*	.0	.0	.0	.0
7.	Recpt 7	*	.0	.0	.0	.0
8.	Recpt 8	*	.0	.0	.0	.0
9.	Recpt 9	*	.3	2.9	.0	.0
10.	Recpt 10	*	.0	3.3	.0	.0
11.	Recpt 11	*	.0	3.3	.0	.0
12.	Recpt 12	*	.3	2.9	.0	.3

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2017 With Action External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S	Z0= 100. CM	ALT= 0. (M)
BRG= WORST CASE	VD= .0 CM/S	
CLAS= 7 (G)	VS= .0 CM/S	
MIXH= 1000. M	AMB= .0 PPM	
SIGTH= 5. DEGREES	TEMP= 5.6 DEGREE (C)	

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	4234	4.4	.0	13.2
B. East	990	0	0	0	AG	6531	4.4	.0	13.2
C. North	0	990	0	0	AG	4231	4.4	.0	13.2
D. South	0	-990	0	0	AG	4812	4.4	.0	13.2
E. Link E	2010	0	3000	0	AG	6745	4.4	.0	13.2
F. Link F	3990	0	3000	0	AG	4260	4.4	.0	13.2
G. Link G	3000	990	3000	0	AG	1571	4.4	.0	13.2
H. Link H	3000	-990	3000	0	AG	2022	4.4	.0	13.2
I. Link I	-3990	0	-3000	0	AG	3148	4.4	.0	13.2
J. Link J	-2010	0	-3000	0	AG	3084	4.4	.0	13.2
K. Link K	-3000	990	-3000	0	AG	2127	4.4	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	4623	4.4	.0	13.2

(LINK COORDINATES (M): X1, Y1, X2, Y2)

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2017 With Action External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	6.8	.4	5.0	1.2	.0	.0	.0	.0	.0
2. Recpt 2	183.	6.0	.0	1.9	.4	3.7	.0	.0	.0	.0
3. Recpt 3	357.	5.6	.0	1.9	3.2	.4	.0	.0	.0	.0
4. Recpt 4	87.	6.9	.4	5.0	.0	1.4	.0	.0	.0	.0
5. Recpt 5	267.	6.1	.0	.0	.0	.0	5.8	.0	.0	.0
6. Recpt 6	267.	6.3	.0	.0	.0	.0	5.2	.4	.5	.0
7. Recpt 7	273.	6.4	.0	.0	.0	.0	5.2	.4	.0	.6
8. Recpt 8	273.	6.1	.0	.0	.0	.0	5.8	.0	.0	.0
9. Recpt 9	177.	4.6	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	183.	4.6	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	273.	4.1	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	4.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2017 With Action External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5. Recpt 5	*	.0	.0	.0	.0
6. Recpt 6	*	.0	.0	.0	.0
7. Recpt 7	*	.0	.0	.0	.0
8. Recpt 8	*	.0	.0	.0	.0
9. Recpt 9	*	.9	.0	.2	3.6
10. Recpt 10	*	.0	.9	.2	3.6
11. Recpt 11	*	2.5	.3	.0	1.3
12. Recpt 12	*	.3	2.5	.0	1.3

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2017 With Action Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S   Z0= 100. CM   ALT= 0. (M)
BRG= WORST CASE   VD= .0 CM/S
CLAS= 7 (G)   VS= .0 CM/S
MIXH= 1000. M   AMB= .0 PPM
SIGTH= 5. DEGREES   TEMP= 5.6 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	2756	4.4	.0	13.2
B. East	990	0	0	0	AG	2638	4.4	.0	13.2
C. North	0	990	0	0	AG	600	4.4	.0	13.2
D. South	0	-990	0	0	AG	624	4.4	.0	13.2
E. Link E	2010	0	3000	0	AG	3137	4.4	.0	13.2
F. Link F	3990	0	3000	0	AG	3360	4.4	.0	13.2
G. Link G	3000	990	3000	0	AG	1753	4.4	.0	13.2
H. Link H	3000	-990	3000	0	AG	1488	4.4	.0	13.2
I. Link I	-3990	0	-3000	0	AG	3308	4.4	.0	13.2
J. Link J	-2010	0	-3000	0	AG	3856	4.4	.0	13.2
K. Link K	-3000	990	-3000	0	AG	376	4.4	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	868	4.4	.0	13.2

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2017 With Action Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	2.7	.2	2.2	.2	.0	.0	.0	.0	.0
2. Recpt 2	267.	2.8	2.3	.2	.2	.0	.0	.0	.0	.0
3. Recpt 3	273.	2.8	2.3	.2	.0	.2	.0	.0	.0	.0
4. Recpt 4	87.	2.7	.2	2.2	.0	.2	.0	.0	.0	.0
5. Recpt 5	93.	3.4	.0	.0	.0	.0	.3	2.6	.5	.0
6. Recpt 6	267.	3.4	.0	.0	.0	.0	2.5	.3	.5	.0
7. Recpt 7	273.	3.3	.0	.0	.0	.0	2.5	.3	.0	.4
8. Recpt 8	87.	3.3	.0	.0	.0	.0	.3	2.6	.0	.4
9. Recpt 9	93.	3.5	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	93.	3.5	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	87.	3.5	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	3.7	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2017 With Action Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5.	Recpt 5	*	.0	.0	.0	.0
6.	Recpt 6	*	.0	.0	.0	.0
7.	Recpt 7	*	.0	.0	.0	.0
8.	Recpt 8	*	.0	.0	.0	.0
9.	Recpt 9	*	.3	3.0	.1	.0
10.	Recpt 10	*	.0	3.3	.0	.0
11.	Recpt 11	*	.0	3.3	.0	.0
12.	Recpt 12	*	.3	3.0	.0	.2

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2031 Baseline External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	0. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	5. DEGREES	TEMP=	5.6 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	4454	2.0	.0	13.2
B. East	990	0	0	0	AG	7244	2.0	.0	13.2
C. North	0	990	0	0	AG	4746	2.0	.0	13.2
D. South	0	-990	0	0	AG	5042	2.0	.0	13.2
E. Link E	2010	0	3000	0	AG	7455	2.0	.0	13.2
F. Link F	3990	0	3000	0	AG	4813	2.0	.0	13.2
G. Link G	3000	990	3000	0	AG	1513	2.0	.0	13.2
H. Link H	3000	-990	3000	0	AG	2183	2.0	.0	13.2
I. Link I	-3990	0	-3000	0	AG	3609	2.0	.0	13.2
J. Link J	-2010	0	-3000	0	AG	3688	2.0	.0	13.2
K. Link K	-3000	990	-3000	0	AG	2432	2.0	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	5051	2.0	.0	13.2

(Link coordinates in M.)

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2031 Baseline External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	3.4	.2	2.5	.6	.0	.0	.0	.0	.0
2. Recpt 2	183.	2.9	.0	.9	.2	1.8	.0	.0	.0	.0
3. Recpt 3	357.	2.8	.0	.9	1.7	.2	.0	.0	.0	.0
4. Recpt 4	87.	3.4	.2	2.5	.0	.7	.0	.0	.0	.0
5. Recpt 5	267.	3.1	.0	.0	.0	.0	2.9	.0	.0	.0
6. Recpt 6	267.	3.1	.0	.0	.0	.0	2.6	.2	.2	.0
7. Recpt 7	273.	3.2	.0	.0	.0	.0	2.6	.2	.0	.3
8. Recpt 8	273.	3.1	.0	.0	.0	.0	2.9	.0	.0	.0
9. Recpt 9	177.	2.3	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	183.	2.3	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	273.	2.1	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	2.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2031 Baseline External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5.	Recpt 5	*	.0	.0	.0	.0
6.	Recpt 6	*	.0	.0	.0	.0
7.	Recpt 7	*	.0	.0	.0	.0
8.	Recpt 8	*	.0	.0	.0	.0
9.	Recpt 9	*	.5	.0	.1	1.8
10.	Recpt 10	*	.0	.5	.1	1.8
11.	Recpt 11	*	1.3	.2	.0	.7
12.	Recpt 12	*	.1	1.3	.0	.7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2031 Baseline Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S	Z0= 100. CM	ALT= 0. (M)
BRG= WORST CASE	VD= .0 CM/S	
CLAS= 7 (G)	VS= .0 CM/S	
MIXH= 1000. M	AMB= .0 PPM	
SIGTH= 5. DEGREES	TEMP= 5.6 DEGREE (C)	

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	2816	2.0	.0	13.2
B. East	990	0	0	0	AG	2554	2.0	.0	13.2
C. North	0	990	0	0	AG	699	2.0	.0	13.2
D. South	0	-990	0	0	AG	637	2.0	.0	13.2
E. Link E	2010	0	3000	0	AG	3125	2.0	.0	13.2
F. Link F	3990	0	3000	0	AG	3323	2.0	.0	13.2
G. Link G	3000	990	3000	0	AG	1823	2.0	.0	13.2
H. Link H	3000	-990	3000	0	AG	1551	2.0	.0	13.2
I. Link I	-3990	0	-3000	0	AG	3328	2.0	.0	13.2
J. Link J	-2010	0	-3000	0	AG	3990	2.0	.0	13.2
K. Link K	-3000	990	-3000	0	AG	314	2.0	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	948	2.0	.0	13.2

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2031 Baseline Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	1.2	.1	1.0	.0	.0	.0	.0	.0	.0
2. Recpt 2	267.	1.3	1.0	.1	.0	.0	.0	.0	.0	.0
3. Recpt 3	273.	1.3	1.0	.1	.0	.0	.0	.0	.0	.0
4. Recpt 4	87.	1.2	.1	1.0	.0	.0	.0	.0	.0	.0
5. Recpt 5	93.	1.6	.0	.0	.0	.0	.1	1.2	.2	.0
6. Recpt 6	267.	1.6	.0	.0	.0	.0	1.1	.1	.2	.0
7. Recpt 7	273.	1.5	.0	.0	.0	.0	1.1	.1	.0	.2
8. Recpt 8	87.	1.5	.0	.0	.0	.0	.1	1.2	.0	.2
9. Recpt 9	93.	1.6	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	93.	1.6	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	87.	1.6	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	1.7	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2031 Baseline Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5.	Recpt 5	*	.0	.0	.0	.0
6.	Recpt 6	*	.0	.0	.0	.0
7.	Recpt 7	*	.0	.0	.0	.0
8.	Recpt 8	*	.0	.0	.0	.0
9.	Recpt 9	*	.1	1.4	.0	.0
10.	Recpt 10	*	.0	1.6	.0	.0
11.	Recpt 11	*	.0	1.6	.0	.0
12.	Recpt 12	*	.1	1.4	.0	.1

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2031 With Action External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S	Z0= 100. CM	ALT= 0. (M)
BRG= WORST CASE	VD= .0 CM/S	
CLAS= 7 (G)	VS= .0 CM/S	
MIXH= 1000. M	AMB= .0 PPM	
SIGTH= 5. DEGREES	TEMP= 5.6 DEGREE (C)	

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	4763	2.0	.0	13.2
B. East	990	0	0	0	AG	7772	2.0	.0	13.2
C. North	0	990	0	0	AG	4734	2.0	.0	13.2
D. South	0	-990	0	0	AG	5809	2.0	.0	13.2
E. Link E	2010	0	3000	0	AG	7979	2.0	.0	13.2
F. Link F	3990	0	3000	0	AG	5000	2.0	.0	13.2
G. Link G	3000	990	3000	0	AG	1700	2.0	.0	13.2
H. Link H	3000	-990	3000	0	AG	2333	2.0	.0	13.2
I. Link I	-3990	0	-3000	0	AG	4297	2.0	.0	13.2
J. Link J	-2010	0	-3000	0	AG	4414	2.0	.0	13.2
K. Link K	-3000	990	-3000	0	AG	3166	2.0	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	5843	2.0	.0	13.2

Link coordinates in (M).

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2031 With Action External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	3.6	.2	2.7	.6	.0	.0	.0	.0	.0
2. Recpt 2	183.	3.2	.0	1.0	.2	2.0	.0	.0	.0	.0
3. Recpt 3	87.	3.1	.0	3.0	.0	.0	.0	.0	.0	.0
4. Recpt 4	87.	3.7	.2	2.7	.0	.8	.0	.0	.0	.0
5. Recpt 5	267.	3.3	.0	.0	.0	.0	3.1	.0	.0	.0
6. Recpt 6	267.	3.4	.0	.0	.0	.0	2.8	.2	.2	.0
7. Recpt 7	273.	3.4	.0	.0	.0	.0	2.8	.2	.0	.3
8. Recpt 8	273.	3.3	.0	.0	.0	.0	3.1	.0	.0	.0
9. Recpt 9	177.	2.7	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	183.	2.7	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	273.	2.4	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	2.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2031 With Action External
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5.	Recpt 5	*	.0	.0	.0	.0
6.	Recpt 6	*	.0	.0	.0	.0
7.	Recpt 7	*	.0	.0	.0	.0
8.	Recpt 8	*	.0	.0	.0	.0
9.	Recpt 9	*	.6	.0	.1	2.0
10.	Recpt 10	*	.0	.6	.1	2.0
11.	Recpt 11	*	1.5	.2	.0	.8
12.	Recpt 12	*	.2	1.5	.0	.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: River Islands 2031 With Action Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	0. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	5. DEGREES	TEMP=	5.6 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. West	-990	0	0	0	AG	3958	2.0	.0	13.2
B. East	990	0	0	0	AG	3869	2.0	.0	13.2
C. North	0	990	0	0	AG	991	2.0	.0	13.2
D. South	0	-990	0	0	AG	790	2.0	.0	13.2
E. Link E	2010	0	3000	0	AG	4072	2.0	.0	13.2
F. Link F	3990	0	3000	0	AG	4639	2.0	.0	13.2
G. Link G	3000	990	3000	0	AG	2318	2.0	.0	13.2
H. Link H	3000	-990	3000	0	AG	1561	2.0	.0	13.2
I. Link I	-3990	0	-3000	0	AG	4252	2.0	.0	13.2
J. Link J	-2010	0	-3000	0	AG	4958	2.0	.0	13.2
K. Link K	-3000	990	-3000	0	AG	725	2.0	.0	13.2
L. Link L	-3000	-990	-3000	0	AG	991	2.0	.0	13.2

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: River Islands 2031 With Action Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

* COORDINATES (M)

RECEPTOR	X	Y	Z
1. Recpt 1	-7	7	1.8
2. Recpt 2	7	7	1.8
3. Recpt 3	7	-7	1.8
4. Recpt 4	-7	-7	1.8
5. Recpt 5	2993	7	1.8
6. Recpt 6	3007	7	1.8
7. Recpt 7	3007	-7	1.8
8. Recpt 8	2993	-7	1.8
9. Recpt 9	-3007	7	1.8
10. Recpt 10	-2993	7	1.8
11. Recpt 11	-2993	-7	1.8
12. Recpt 12	-3007	-7	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. Recpt 1	93.	1.7	.2	1.4	.1	.0	.0	.0	.0	.0
2. Recpt 2	267.	1.7	1.4	.2	.1	.0	.0	.0	.0	.0
3. Recpt 3	273.	1.7	1.4	.2	.0	.1	.0	.0	.0	.0
4. Recpt 4	87.	1.7	.2	1.4	.0	.1	.0	.0	.0	.0
5. Recpt 5	93.	2.1	.0	.0	.0	.0	.2	1.6	.3	.0
6. Recpt 6	267.	2.0	.0	.0	.0	.0	1.4	.2	.3	.0
7. Recpt 7	273.	1.9	.0	.0	.0	.0	1.4	.2	.0	.2
8. Recpt 8	87.	2.0	.0	.0	.0	.0	.2	1.6	.0	.2
9. Recpt 9	93.	2.1	.0	.0	.0	.0	.0	.0	.0	.0
10. Recpt 10	93.	2.0	.0	.0	.0	.0	.0	.0	.0	.0
11. Recpt 11	87.	2.0	.0	.0	.0	.0	.0	.0	.0	.0
12. Recpt 12	87.	2.1	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: River Islands 2031 With Action Internal
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. Recpt 1	.0	.0	.0	.0
2. Recpt 2	.0	.0	.0	.0
3. Recpt 3	.0	.0	.0	.0
4. Recpt 4	.0	.0	.0	.0

5.	Recpt 5	*	.0	.0	.0	.0
6.	Recpt 6	*	.0	.0	.0	.0
7.	Recpt 7	*	.0	.0	.0	.0
8.	Recpt 8	*	.0	.0	.0	.0
9.	Recpt 9	*	.2	1.7	.0	.0
10.	Recpt 10	*	.0	1.9	.0	.0
11.	Recpt 11	*	.0	1.9	.0	.0
12.	Recpt 12	*	.2	1.7	.0	.1

Appendix F-5

SCREEN3 Outputs

10/19/12

12:18:27

```
  ***  SCREEN3 MODEL RUN  ***
  *** VERSION DATED 96043 ***
```

River Islands Average Scenario

```
 SIMPLE TERRAIN INPUTS:
    SOURCE TYPE                 =        AREA
    EMISSION RATE (G/(S-M**2))  =     0.537000E-08
    SOURCE HEIGHT (M)           =       0.0000
    LENGTH OF LARGER SIDE (M)   =    3459.0000
    LENGTH OF SMALLER SIDE (M)  =    3459.0000
    RECEPTOR HEIGHT (M)         =       0.0000
    URBAN/RURAL OPTION          =        RURAL
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

    MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


 BUOY. FLUX =    0.000 M**4/S**3;  MOM. FLUX =    0.000 M**4/S**2.

 *** FULL METEOROLOGY ***

 **********************************
 *** SCREEN AUTOMATED DISTANCES ***
 **********************************
```

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	1.447	6	1.0	1.0	10000.0	0.00	45.
100.	1.466	6	1.0	1.0	10000.0	0.00	45.
200.	1.485	6	1.0	1.0	10000.0	0.00	45.
300.	1.503	6	1.0	1.0	10000.0	0.00	45.
400.	1.521	6	1.0	1.0	10000.0	0.00	45.
500.	1.539	6	1.0	1.0	10000.0	0.00	45.
600.	1.557	6	1.0	1.0	10000.0	0.00	45.
700.	1.574	6	1.0	1.0	10000.0	0.00	45.
800.	1.592	6	1.0	1.0	10000.0	0.00	45.
900.	1.609	6	1.0	1.0	10000.0	0.00	45.
1000.	1.626	6	1.0	1.0	10000.0	0.00	45.
1100.	1.643	6	1.0	1.0	10000.0	0.00	45.
1200.	1.659	6	1.0	1.0	10000.0	0.00	45.
1300.	1.676	6	1.0	1.0	10000.0	0.00	45.
1400.	1.692	6	1.0	1.0	10000.0	0.00	45.
1500.	1.708	6	1.0	1.0	10000.0	0.00	45.
1600.	1.724	6	1.0	1.0	10000.0	0.00	45.

1700.	1.740	6	1.0	1.0	10000.0	0.00	45.
1800.	1.756	6	1.0	1.0	10000.0	0.00	44.
1900.	1.772	6	1.0	1.0	10000.0	0.00	44.
2000.	1.787	6	1.0	1.0	10000.0	0.00	44.
2100.	1.803	6	1.0	1.0	10000.0	0.00	44.
2200.	1.818	6	1.0	1.0	10000.0	0.00	44.
2300.	1.833	6	1.0	1.0	10000.0	0.00	44.
2400.	1.848	6	1.0	1.0	10000.0	0.00	44.
2500.	1.321	6	1.0	1.0	10000.0	0.00	45.
2600.	1.146	6	1.0	1.0	10000.0	0.00	45.
2700.	1.050	6	1.0	1.0	10000.0	0.00	45.
2800.	0.9848	6	1.0	1.0	10000.0	0.00	45.
2900.	0.9366	6	1.0	1.0	10000.0	0.00	45.
3000.	0.8974	6	1.0	1.0	10000.0	0.00	45.
3500.	0.7723	6	1.0	1.0	10000.0	0.00	45.
4000.	0.6969	6	1.0	1.0	10000.0	0.00	45.
4500.	0.6439	6	1.0	1.0	10000.0	0.00	45.
5000.	0.6037	6	1.0	1.0	10000.0	0.00	45.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

2446.	1.855	6	1.0	1.0	10000.0	0.00	45.

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
15.	1.450	6	1.0	1.0	10000.0	0.00	45.
30.	1.453	6	1.0	1.0	10000.0	0.00	45.
76.	1.461	6	1.0	1.0	10000.0	0.00	45.
152.	1.476	6	1.0	1.0	10000.0	0.00	45.
305.	1.504	6	1.0	1.0	10000.0	0.00	45.
402.	1.522	6	1.0	1.0	10000.0	0.00	45.
610.	1.559	6	1.0	1.0	10000.0	0.00	45.
1524.	1.712	6	1.0	1.0	10000.0	0.00	45.
3048.	0.8818	6	1.0	1.0	10000.0	0.00	45.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1.855	2446.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

10/19/12

12:21:15

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

River Islands Worst Case Scenario

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.103300E-06
SOURCE HEIGHT (M) = 0.0000
LENGTH OF LARGER SIDE (M) = 1102.0000
LENGTH OF SMALLER SIDE (M) = 1102.0000
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	19.97	6	1.0	1.0	10000.0	0.00	45.
100.	20.52	6	1.0	1.0	10000.0	0.00	45.
200.	21.15	6	1.0	1.0	10000.0	0.00	45.
300.	21.74	6	1.0	1.0	10000.0	0.00	45.
400.	22.30	6	1.0	1.0	10000.0	0.00	45.
500.	22.83	6	1.0	1.0	10000.0	0.00	45.
600.	23.34	6	1.0	1.0	10000.0	0.00	45.
700.	23.82	6	1.0	1.0	10000.0	0.00	45.
800.	17.98	6	1.0	1.0	10000.0	0.00	45.
900.	12.80	6	1.0	1.0	10000.0	0.00	45.
1000.	10.87	6	1.0	1.0	10000.0	0.00	45.
1100.	9.658	6	1.0	1.0	10000.0	0.00	45.
1200.	8.790	6	1.0	1.0	10000.0	0.00	45.
1300.	8.132	6	1.0	1.0	10000.0	0.00	45.
1400.	7.606	6	1.0	1.0	10000.0	0.00	45.
1500.	7.177	6	1.0	1.0	10000.0	0.00	45.
1600.	6.814	6	1.0	1.0	10000.0	0.00	45.

1700.	6.500	6	1.0	1.0	10000.0	0.00	45.
1800.	6.225	6	1.0	1.0	10000.0	0.00	45.
1900.	5.980	6	1.0	1.0	10000.0	0.00	45.
2000.	5.760	6	1.0	1.0	10000.0	0.00	45.
2100.	5.561	6	1.0	1.0	10000.0	0.00	45.
2200.	5.380	6	1.0	1.0	10000.0	0.00	45.
2300.	5.215	6	1.0	1.0	10000.0	0.00	45.
2400.	5.064	6	1.0	1.0	10000.0	0.00	45.
2500.	4.927	6	1.0	1.0	10000.0	0.00	45.
2600.	4.800	6	1.0	1.0	10000.0	0.00	45.
2700.	4.683	6	1.0	1.0	10000.0	0.00	45.
2800.	4.576	6	1.0	1.0	10000.0	0.00	45.
2900.	4.475	6	1.0	1.0	10000.0	0.00	45.
3000.	4.381	6	1.0	1.0	10000.0	0.00	45.
3500.	3.983	6	1.0	1.0	10000.0	0.00	45.
4000.	3.678	6	1.0	1.0	10000.0	0.00	45.
4500.	3.424	6	1.0	1.0	10000.0	0.00	45.
5000.	3.207	6	1.0	1.0	10000.0	0.00	45.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

780.	24.20	6	1.0	1.0	10000.0	0.00	45.

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
15.	20.06	6	1.0	1.0	10000.0	0.00	44.
30.	20.18	6	1.0	1.0	10000.0	0.00	45.
76.	20.36	6	1.0	1.0	10000.0	0.00	45.
152.	20.85	6	1.0	1.0	10000.0	0.00	45.
305.	21.77	6	1.0	1.0	10000.0	0.00	45.
402.	22.31	6	1.0	1.0	10000.0	0.00	45.
610.	23.38	6	1.0	1.0	10000.0	0.00	45.
1524.	7.084	6	1.0	1.0	10000.0	0.00	45.
3048.	4.337	6	1.0	1.0	10000.0	0.00	45.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	24.20	780.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

Appendix F-6

San Joaquin Valley Air Pollution Control District Reduction Measures

MEASURE #	*Measure Name*	*Commercial*	*Mixed-Use*	*Residential*	*Estimated CO2 Equivalent Point Reductions*	*Measure Description*
1	**Bike parking**	C	M	~	0.625	Non-residential projects provide plentiful short-term and long-term bicycle parking facilities to meet peak season maximum demand. Short term facilities are provided at a minimum ratio of one bike rack space per 20 vehicle spaces. Long-term facilities provide a minimum ratio of one long-term bicycle storage space per 20 **employee** parking spaces.
2	**End of trip facilities**	C	M	~	0.625	Non-residential projects provide “end-of-trip” facilities including showers, lockers, and changing space. Facilities shall be provided in the following ratio: four clothes lockers and one shower provided for every 80 employee parking spaces. For projects with 160 or more employee parking spaces, separate facilities are required for each gender.
3	**Bike parking at multi-unit residential**	~	~	R	0.625	Long-term bicycle parking is provided at apartment complexes or condominiums without garages. Project provides one long-term bicycle parking space for each unit without a garage. Long-term facilities shall consist of one of the following: a bicycle locker, a locked room with standard racks and access limited to bicyclists only, or a standard rack in a location that is staffed and/or monitored by video surveillance 24 hours per day.
4	**Proximity to bike path/bike lanes**	C	M	R	0.625	Entire project is located within 1/2 mile of an existing Class I or Class II bike lane and project design includes a comparable network that connects the project uses to the existing offsite facility. Existing facilities are defined as those facilities that are physically constructed and ready for use prior to the first 20% of the projects occupancy permits being granted. Project design includes a designated bicycle route connecting all units, on-site bicycle parking facilities, offsite bicycle facilities, site entrances, and primary building entrances to existing Class I or Class II bike lane(s) within 1/2 mile. Bicycle route connects to all streets contiguous with project site. Bicycle route has minimum conflicts with automobile parking and circulation facilities. All streets internal to the project wider than 75 feet have class II bicycle lanes on both sides.
5	**Pedestrian network**	C	M	R	1	The project provides a pedestrian access network that internally links all uses and connects to **existing** external streets and pedestrian facilities. Existing facilities are defined as those facilities that are physically constructed and ready for use prior to the first 20% of the projects occupancy permits being granted.
5a	**Pedestrian Network**	C	M	R	0.5	The project provides a pedestrian access network that internally links all uses for connecting to **planned** external streets and pedestrian facilities (facilities must be included pedestrian master plan or equivalent).

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
6	**Pedestrian barriers minimized**	C	M	R	1	Site design and building placement minimize barriers to pedestrian access and interconnectivity. Physical barriers such as walls, berms, landscaping, and slopes between residential and non-residential uses that impede bicycle or pedestrian circulation are eliminated. Barriers to pedestrian access of neighboring facilities and sites are minimized. This measure is not meant to prevent the limited use of barriers to ensure public safety by prohibiting access to hazardous areas, etc..
7	**Bus shelter for existing transit service**	C	M	R	0.5	Bus or Streetcar service provides headways of one hour or less for stops within 1/4 mile; project provides safe and convenient bicycle/pedestrian access to transit stop(s) and provides essential transit stop improvements (i.e., shelters, route information, benches, and lighting).
8	**Bus shelter for planned transit service**	C	M	R	0.25	Project provides transit stops with safe and convenient bicycle/pedestrian access. Project provides essential transit stop improvements (i.e., shelters, route information, benches, and lighting) in anticipation of future transit service. If measure 7 is selected, it excludes this measure.
9	**Traffic calming**	C	M	R	n/a	Project design includes pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Roadways are designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips by featuring traffic calming measures. Traffic calming measures include: bike lanes, center islands, closures (cul-de-sacs), diverters, education, forced turn lanes, roundabouts, speed humps, etc.. Percent of Streets with Improvements. Assume the percent reductions noted below.
9a	**Traffic calming**	C	M	R	0.25	Reduction applies if: 25% of streets with improvement and 25% of intersections with Improvements; or 50% of streets with improvement and 25% of intersections with Improvements.
9b	**Traffic calming**	C	M	R	0.5	Reduction applies if: 25% of streets with improvement and 75% of intersections with Improvements; or 25% of streets with improvement and 100% of intersections with Improvements; or 50% of streets with improvement and 50% of intersections with Improvements
9c	**Traffic calming**	C	M	R	0.75	Reduction applies if: 50% of streets with improvement and 100% of intersections with Improvements; or 75% of streets with improvement and 75% of intersections with Improvements; or 75% of streets with improvement and 100% of intersections with Improvement

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
9d	**Traffic calming**	C	M	R	1	Reduction applies if: 100% of streets with improvement and 100% of intersections with Improvements.
10	**Paid parking**	C	M	R	n/a	Employee and/or customer paid parking system. Assume the percent reductions noted in 10a thru 10e.
10a	**Paid parking**	C	M	R	5	Urban site within 1/4 mile from transit stop: Employee and/or customer paid parking system. Daily charge for parking must be equal to or greater than the cost of a local transit pass + 20%. Monthly charge for parking must be equal to or greater than the cost of a local monthly transit pass, plus 20%.
10b	**Paid parking**	C	M	R	1.50	Urban site greater than 1/4 mile from transit stop: Employee and/or customer paid parking system. Daily charge for parking must be equal to or greater than the cost of a local transit pass + 20%. Monthly charge for parking must be equal to or greater than the cost of a local monthly transit pass, plus 20%.
10c	**Paid parking**	C	M	R	2	Suburban site within 1/4 mile of transit stop: Employee and/or customer paid parking system. Daily charge for parking must be equal to or greater than the cost of a local transit pass + 20%. Monthly charge for parking must be equal to or greater than the cost of a local monthly transit pass, plus 20%.
10d	**Paid parking**	C	M	R	1	Suburban site greater than 1/4 mile from transit stop: Employee and/or customer paid parking system. Daily charge for parking must be equal to or greater than the cost of a local transit pass + 20%. Monthly charge for parking must be equal to or greater than the cost of a local monthly transit pass, plus 20%.
10e	**Paid parking**	C	M	R	0.6	Parking cash out: Employer provides employees with a choice of forgoing subsidized parking for a cash payment equivalent to the cost of the parking space to the employer.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
11	**Minimum parking**	C	M	R	3	Provide minimum amount of parking required. Special review of parking required. If zoning codes in the San Joaquin Valley area have provisions that allow a project to build less than the typically mandated amount of parking if the development features design elements that reduce the need for automobile use. This measure recognizes the air quality benefit that results when facilities minimize parking needs, and grants mitigation value to project that implement all available parking reductions. Once land uses are determined, the trip reduction factor associated with this measure can be determined by utilizing the Institute of Transportation Engineers (ITE) Parking generation publication. The reduction in trips can be computed as shown below by the ratio of the difference of minimum parking required by code and ITE peak parking demand to ITE peak parking demand for the land uses multiplied by 50%. The maximum achievable trip reduction is 6%. For projects where retail space occupies 50% or more of the total built space, do not use December specific parking generation rates (from ITE). Percent Trip Reduction = 50*[(min parking required by code - ITE peak parking demand) / (ITE peak parking demand)].
12	**Parking reduction beyond code**	C	M	R	6	Provide parking reduction less than code. Special review of parking required. Recommend a Shared Parking strategy. Trip reductions associated with parking reductions beyond code shall be computed in the same manner as described under measure 11, as the same methodology applies. The maximum achievable trip reduction is 12%. This measure can be readily implemented through a Shared Parking strategy, wherein parking is utilized jointly among different land uses, buildings, and facilities in an area that experience peak parking needs at different times of day and day of the week. For example, residential uses and/or restaurant/retail uses, which experience peak parking demand during the evening/night and on the weekends, arrange to share parking facilities with office and/or educational uses, which experience peak demand during business hours and during the week.
13	**Pedestrian pathway through parking**	C	M	R	0.5	Provide a parking lot design that includes clearly marked and shaded pedestrian pathways between transit facilities and building entrances. Pathway must connect to all transit facilities internal or adjacent to project site. Site plan should demonstrate how the pathways are clearly marked, shaded, and are placed between transit facilities and building entrances.
14	**Off street parking**	C	M	R	n/a	Parking facilities are not adjacent to street frontage. Assume the percent reductions noted in 14a thru 14c.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
14a	**Off street parking**	C	M	R	1.5	For 1.5% reduction, parking facilities shall not be sited adjacent to public roads contiguous with project site. Functioning pedestrian entrances to major site uses are located along street frontage. Parking facilities do not restrict pedestrian, bicycle, or transit access from adjoining uses. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a description of where parking is located relative to the buildings on the site, site plans, maps, or other graphics, which demonstrate the placement of parking facilities behind on-site buildings relative to streets contiguous with the project site. Surrounding uses should be high density or mixed-use, there shall be other adjoining pedestrian and bicycle connections, such as wide sidewalks and bike lanes, and surrounding uses shall also implement measure 15.
14b	**Off street parking**	C	M	R	1	For 1.0% reduction, (parking structures only) proponent must show that parking facilities that face street frontage feature ground floor retail along street frontage. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of the parking facility and the amount of retail space on the ground floor, site plans, maps, or other graphics demonstrating the placement of retail/commercial space along all street fronts contiguous with parking structure.
14c	**Off street parking**	C	M	R	0.1	For 0.1% reduction, the project is not among high-density or mixed uses, is not connected to pedestrian or bicycle access ways, or is among uses that do not also hide parking. This point value is reflective of the importance that other pedestrian and density measures be in place in order for this measure to be effective.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
15	**Office/Mixed-Use proximate to transit**	C	M	~	0	Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).
15aa	**Office/Mixed-Use proximate to Planned Light Rail Transit**	C	M	~	0.4	0.75-1.5 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
15ab	**Office/Mixed-Use proximate to <u>Planned Light Rail Transit</u>**	C	M	~	0.5	1.5-2.25 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).
15ac	**Office/Mixed-Use proximate to <u>Planned Light Rail Transit</u>**	C	M	~	0.75	2.25 or greater FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
15ba	**Office/Mixed-Use proximate to <u>Planned Bus Rapid Transit</u>**	C	M	~	0.2	0.75-1.5 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).
15bb	**Office/Mixed-Use proximate to <u>Planned Bus Rapid Transit</u>**	C	M	~	0.25	1.5-2.25 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).

MEASURE #	***Measure Name***	***Commercial***	***Mixed-Use***	***Residential***	***Estimated CO2 Equivalent Point Reductions***	***Measure Description***
15bc	**Office/Mixed-Use proximate to <u>Planned Bus Rapid Transit</u>**	C	M	~	0.3	2.25 or greater FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).
15ca	**Office/Mixed-Use proximate to <u>Existing Light Rail Transit</u>**	C	M	~	0.75	0.75-1.5 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).

MEASURE #	***Measure Name***	***Commercial***	***Mixed-Use***	***Residential***	***Estimated CO2 Equivalent Point Reductions***	***Measure Description***
15cb	**Office/Mixed-Use proximate to <u>Existing Light Rail Transit</u>**	C	M	~	1	1.5-2.25 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).
15cc	**Office/Mixed-Use proximate to <u>Existing Light Rail Transit</u>**	C	M	~	1.5	2.25 or greater FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
15da	**Office/Mixed-Use proximate to <u>Existing Bus Rapid Transit</u>**	C	M	~	0.4	0.75-1.5 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).
15db	**Office/Mixed-Use proximate to <u>Existing Bus Rapid Transit</u>**	C	M	~	0.5	1.5-2.25 FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).

MEASURE #	***Measure Name***	***Commercial***	***Mixed-Use***	***Residential***	***Estimated CO2 Equivalent Point Reductions***	***Measure Description***
15dc	**Office/Mixed-Use proximate to <u>Existing Bus Rapid Transit</u>**	C	M	~	0.75	2.25 or greater FAR (Floor to Area Ratio): Mitigation value is based on project density and proximity to transit. Planned transit must be in MTP or RT Master Plan. To count as "existing transit" service must be fully operational prior to the first 20% of the projects occupancy permits being granted. Project must provide safe and convenient pedestrian and bicycle access to all transit stops within 1/4 mile. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, a written description of how the project complies with the measure, a map or graphic depicting the location of the project in relation to the transit stop. Graphic should demonstrate a 1/4 mile radius, arc, from transit and planned pathways and linkages to the transit stop. Proponent shall also provide graphics depicting the size and layout of the building as well as the calculations demonstrating the FAR (floor to area ratio).
16	**Orientation toward existing transit, bikeway, or pedestrian corridor**	C	M	R	0.5	Project is oriented towards **existing** transit, bicycle, or pedestrian corridor. Setback distance is minimized. Setback distance between project and adjacent uses is reduced to the minimum allowed under jurisdiction code. Setback distance between different buildings on project site is reduced to the minimum allowed under jurisdiction code. Setbacks between project buildings and sidewalks is reduced to the minimum allowed under jurisdiction code. Buildings are oriented towards street frontage. Primary entrances to buildings are located along public street frontage. Project provides bicycle access to **existing** bicycle corridor. Project provides access to **existing** pedestrian corridor. **(Cannot get points for both this measure and measure 17)**
17	**Orientation toward planned transit, bikeway, or pedestrian corridor**	C	M	~	0.25	Project is oriented towards **planned** transit, bicycle, or pedestrian corridor. Setback distance is minimized. Planned transit, bicycle or pedestrian corridor must be in the MTP, RT Master Plan, General Plan, or Community Plan. Setback distance between project and existing or planned adjacent uses is minimized or non-existent. Setback distance between different buildings on project site is minimized. Setbacks between project buildings and planned or existing sidewalks are minimized. Buildings are oriented towards existing or planned street frontage. Primary entrances to buildings are located along planned or existing public street frontage. Project provides bicycle access to any **planned** bicycle corridor(s). Project provides pedestrian access to any **planned** pedestrian corridor(s).**(Cannot get points for both this measure and measure 16)**

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
18	**Residential Density with No Transit**	~	~	R	0	3-6 Du/acre: Project provides high-density residential development. Mitgation value is based on project density with **no transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area.
18a	**Residential Density with No Transit**	~	~	R	1	7-10 Du/acre: Project provides high-density residential development. Mitgation value is based on project density with **no transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area.
18b	**Residential Density with No Transit**	~	~	R	3	11-20 Du/acre: Project provides high-density residential development. Mitgation value is based on project density with **no transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area.
18c	**Residential Density with No Transit**	~	~	R	5	21-30 Du/Acre: Project provides high-density residential development. Mitgation value is based on project density with **no transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area.
18d	**Residential Density with No Transit**	~	~	R	6	31-40 Du/acre: Project provides high-density residential development. Mitgation value is based on project density with **no transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area.
18e	**Residential Density with No Transit**	~	~	R	8	41-50 Du/acre: Project provides high-density residential development. Mitgation value is based on project density with **no transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area.
18f	**Residential Density with No Transit**	~	~	R	10	50+ Du/acre: Project provides high-density residential development. Mitgation value is based on project density with **no transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
18aa	**Residential density With Planned Light Rail Transit**	~	~	R	0	3-6 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18ab	**Residential density With Planned Light Rail Transit**	~	~	R	1.75	7-10 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18ac	**Residential density With Planned Light Rail Transit**	~	~	R	3.75	11-20 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18ad	**Residential density With Planned Light Rail Transit**	~	~	R	5.75	21-30 Du/Acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
18ae	**Residential density With Planned Light Rail Transit**	~	~	R	6.75	31-40 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18af	**Residential density With Planned Light Rail Transit**	~	~	R	8.75	41-50 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18ag	**Residential density With Planned Light Rail Transit**	~	~	R	10.75	50+ Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18ba	**Residential density With Planned Bus Rapid Transit**	~	~	R	0	3-6 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned bus rapid transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
18bb	**Residential density With Planned Bus Rapid Transit**	~	~	R	1.25	7-10 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned bus rapid transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18bc	**Residential density With Planned Bus Rapid Transit**	~	~	R	3.25	11-20 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned bus rapid transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18bd	**Residential density With Planned Bus Rapid Transit**	~	~	R	5.25	21-30 Du/Acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned bus rapid transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18be	**Residential density With Planned Bus Rapid Transit**	~	~	R	6.25	31-40 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned bus rapid transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.

MEASURE #	*Measure Name*	*Commercial*	*Mixed-Use*	*Residential*	*Estimated CO2 Equivalent Point Reductions*	*Measure Description*
18bf	**Residential density With Planned Bus Rapid Transit**	~	~	R	8.25	41-50 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned bus rapid transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18bg	**Residential density With Planned Bus Rapid Transit**	~	~	R	10.25	50+ Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **planned bus rapid transit**. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border. Planned transit must be in a MTP or RT Master Plan.
18ca	**Residential Density with Existing Light Rail Transit**	~	~	R	0	3-6 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18cb	**Residential Density with Existing Light Rail Transit**	~	~	R	2.5	7-10 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
18cc	**Residential Density with Existing Light Rail Transit**	~	~	R	4.5	11-20 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18cd	**Residential Density with Existing Light Rail Transit**	~	~	R	6.5	21-30 Du/Acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18ce	**Residential Density with Existing Light Rail Transit**	~	~	R	7.5	31-40 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18cf	**Residential Density with Existing Light Rail Transit**	~	~	R	9.5	41-50 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
18cg	**Residential Density with Existing Light Rail Transit**	~	~	R	11.5	50+ Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing light rail** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18da	**Residential Density with Existing Bus Rapid Transit**	~	~	R	0	3-6 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing bus rapid** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18db	**Residential Density with Existing Bus Rapid Transit**	~	~	R	2	7-10 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing bus rapid** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18dc	**Residential Density with Existing Bus Rapid Transit**	~	~	R	4	11-20 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing bus rapid** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.

MEASURE #	***Measure Name***	***Commercial***	***Mixed-Use***	***Residential***	***Estimated CO2 Equivalent Point Reductions***	***Measure Description***
18dd	**Residential Density with Existing Bus Rapid Transit**	~	~	R	6	21-30 Du/Acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing bus rapid** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18de	**Residential Density with Existing Bus Rapid Transit**	~	~	R	7	31-40 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing bus rapid** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18df	**Residential Density with Existing Bus Rapid Transit**	~	~	R	9	41-50 Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing bus rapid** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
18dg	**Residential Density with Existing Bus Rapid Transit**	~	~	R	11	50+ Du/acre: Project provides high-density residential development. Mitgation value is based on project density and proximity to **existing bus rapid** transit. Density is calculated by determining the number of units per acre ("du/acre") within the residential portion of the project's net lot area. Existing transit facilities must be within 1/4 mile of project border. Project provides safe and convenient bicycle/pedestrian access to all transit stop(s) within 1/4 mile of project border.
19	**Street grid**	C	M	R	1	Multiple and direct street routing (grid style). The measure applies to projects with an internal connectivity factor (CF)>=0.80, and average of 1/4 mile or less between external connections along perimeter of project. [CF=# of intersections / (# of cul-de-sacs + intersections)]

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
20	**Neighborhood Electric Vehicle access**	C	M	R	n/a	Make physical development consistent with requirements for neighborhood electric vehicles (NEV). Current studies show that for most trips, NEVs do not replace gas,fueled vehicles as the primary vehicle. For the purpose of providing incentives for developers to promote NEV use, assume the percent reductions noted in 20a, 20b, or 20c.
20a	**Neighborhood Electric Vehicle access**	C	M	R	1.5	Make physical development consistent with requirements for neighborhood electric vehicles (NEV). Current studies show that for most trips, NEVs do not replace gas,fueled vehicles as the primary vehicle. For 1.5% reduction, a neighborhood shall have internal NEV connections and connections to other existing NEV networks serving all other types of uses.
20b	**Neighborhood Electric Vehicle access**	C	M	R	1	Make physical development consistent with requirements for neighborhood electric vehicles (NEV). Current studies show that for most trips, NEVs do not replace gas,fueled vehicles as the primary vehicle. For 1.0% reduction, a neighborhood shall have internal and external connections to surrounding neighborhoods.
20c	**Neighborhood Electric Vehicle access**	C	M	R	0.5	Make physical development consistent with requirements for neighborhood electric vehicles (NEV). Current studies show that for most trips, NEVs do not replace gas,fueled vehicles as the primary vehicle. For 0.5% reduction, a neighborhood has internal connections only.
21	**Affordable Housing Component**	~	~	R	n/a	Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04. Assume the percent reductions noted in 21a thru 21j.
21a	**Affordable Housing Component**	~	~	R	0.6	Reductions apply if 15% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.

MEASURE #	*Measure Name*	*Commercial*	*Mixed-Use*	*Residential*	*Estimated CO2 Equivalent Point Reductions*	*Measure Description*
21b	**Affordable Housing Component**	~	~	R	0.8	Reductions apply if 20% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.
21c	**Affordable Housing Component**	~	~	R	1.2	Reductions apply if 30% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.
21d	**Affordable Housing Component**	~	~	R	1.6	Reductions apply if 40% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.
21e	**Affordable Housing Component**	~	~	R	2	Reductions apply if 50% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
21f	**Affordable Housing Component**	~	~	R	2.4	Reductions apply if 60% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.
21g	**Affordable Housing Component**	~	~	R	2.8	Reductions apply if 70% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.
21h	**Affordable Housing Component**	~	~	R	3.2	Reductions apply if 80% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.
21i	**Affordable Housing Component**	~	~	R	3.6	Reductions apply if 90% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
21j	**Affordable Housing Component**	~	~	R	4	Reductions apply if 100% of units are deed-restricted below the market housing rate: Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]. Percent reductions shall be calculated according to the following formula: % reduction=% units deed-restricted below the market rate housing *0.04.
22	**Urban Mixed-Use Measure**	~	M	~	n/a	Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio. Assume the percent reductions noted in 22a thru 22g.
22a	**Urban Mixed-Use Measure**	~	M	~	3	Reductions apply if the ratio (jobs:houses) is ≥ 0.5 and < 1.0: Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio.
22b	**Urban Mixed-Use Measure**	~	M	~	6.6	Reductions apply if the ratio (jobs:houses) is ≥ 1 and < 1.5: Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio.
22c	**Urban Mixed-Use Measure**	~	M	~	9	Reductions apply if the ratio (jobs:houses) is ≥ 1.5 and < 2.0: Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio.

MEASURE #	Measure Name	Commercial	Mixed-Use	Residential	Estimated CO2 Equivalent Point Reductions	Measure Description
22d	**Urban Mixed-Use Measure**	~	M	~	7.29	Reductions apply if the ratio (jobs:houses) is ≥ 2.0 and < 2.5: Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio.
22e	**Urban Mixed-Use Measure**	~	M	~	6	Reductions apply if the ratio (jobs:houses) is ≥ 2.5 and < 3.0: Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio.
22f	**Urban Mixed-Use Measure**	~	M	~	5	Reductions apply if the ratio (jobs:houses) is ≥ 3.0 and < 3.5: Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio.
22g	**Urban Mixed-Use Measure**	~	M	~	4.2	Reductions apply if the ratio (jobs:houses) is ≥3.5 and ≤ 4.0: Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with functional inter-relationships and a coherent physical design. Mitigation points for this measure depend on job to housing ratio.
23	**Suburban mixed-use**	C	M	R	3	Have at least three of the following on site and/or offsite within ¼ mile: Residential Development, Retail Development, Park, Open Space, or Office.
24	**Other mixed-use**	~	M	R	1	All residential units are within ¼ mile of parks, schools or other civic uses.
27	**Energy Star roof**	C	M	R	0.5	Install Energy Star labeled roof materials. Energy star qualified roof products reflect more of the sun's rays, decreasing the amount of heat transferred into a building.
28	**Onsite renewable energy system**	C	M	R	1	Project provides onsite renewable energy system(s).
29	**Exceed title 24**	C	M	R	1	Project Exceeds title 24 requirements by 20%

MEASURE #	***Measure Name***	***Commercial***	***Mixed-Use***	***Residential***	***Estimated CO2 Equivalent Point Reductions***	***Measure Description***
30	**Solar orientation**	~	~	R	0.5	Orient 75 or more percent of homes and/or buildings to face either north or south (within 30 degrees of N/S)
31	**Non-Roof Surfaces**	C	M	R	1	Provide shade (within 5 years) and/or use light-colored/high-albedo materials (reflectance of at least 0.3) and/or open grid pavement for at least 30% of the site's non-roof impervious surfaces, including parking lots, walkways, plazas, etc.; OR place a minimum of 50% of parking spaces underground or covered by structured parking; OR use an open-grid pavement system (less than 50% impervious) for a minimum of 50% of the parking lot area. Unshaded parking lot areas, driveways, fire lanes, and other paved areas have a minimum albedo of .3 or greater
32	**Green Roof**	C	M	R	0.5	Install a vegetated roof that covers at least 50% of roof area

Appendix G – River Islands at Lathrop Evaluation of Compliance with Executive Order 11988, Flood Plain Management

Executive Order 11988 Compliance Analysis

River Islands at Lathrop

City of Lathrop
San Joaquin County, California
Stewart Tract and Paradise Cut
USGS Lathrop and Union Island Quadrangles

Prepared for the
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RIVER ISLANDS AT LATHROP
EVALUATION OF COMPLIANCE WITH
EXECUTIVE ORDER 11988, FLOOD PLAIN MANAGEMENT

Introduction

Califia, LLC, developer of the River Islands at Lathrop project (Applicant) has applied for certain authorizations from the U.S. Army Corps of Engineers (Corps) including Section 404 permits to fill certain wetlands and other waters of the United States, as well as Section 408 authorization for modification of the Federal flood protection infrastructure (the Corps Approvals). The Corps Approvals are being requested in connection with the development of a 4,905 acre master plan located in Lathrop, California (the Project).

Beginning in 2004, the Corps and its contractor ICF Jones and Stokes, Inc. (JSA) have been drafting an Environmental Impact Statement (EIS) for the portions of the River Islands Project that are subject to Federal action. The Project had previously received local approvals, including certification of an Environmental Impact Report (EIR) and the first phase of development which did not require Federal permits is currently underway. It is anticipated that an administrative draft of the River Islands EIS which covers the second phase of the Project will be completed by late 2009.

The purpose of this memo is to analyze the proposed Project's compliance with Executive Order 11988 (EO 11988).

Project Location

The Project is located in the City of Lathrop (City), San Joaquin County, California. Lathrop is situated in the San Joaquin Valley, at the junction of Interstate 5 (I-5), I-205, and State Route 120 (SR 120), approximately 65 miles east of San Francisco and 55 miles south of Sacramento (Figure 1[1]). The roughly 4,905 acre Project Site is located on the Stewart Tract and in Paradise Cut. Stewart Tract is located in the Secondary Zone (as further described below) of the Sacramento-San Joaquin Delta bounded by the San Joaquin River on the north and east, Old River on the west, and Paradise Cut on the south. Paradise Cut is a flood control bypass channel that was designed to convey flood waters from the San Joaquin River to Old River when flood flows in the San Joaquin River overtop a rock dam weir (Paradise Weir). Paradise Cut is the only bypass channel located in the South Delta and is critical to the conveyance of flood flows in the region.

In 1992, the passage of the Delta Protection Act redefined the "Legal Delta" and created the "Primary" and "Secondary" zones within the Legal Delta. Urban development is not allowed in the Primary Zone due to soil conditions, sea level or below land elevations, extensive agricultural uses and other factors. Urban development is allowed in the Secondary zone and several cities currently exist in the Secondary Zone, including

[1] All figures and exhibits are included in sequential order at the end of the report.

Lathrop. At the time of the legislation, the Stewart Tract was placed in the Secondary Zone where development is allowed. The Stewart Tract has base land elevations that average 8 to 12 feet above sea level and there is no organic material (i.e. peat soil) on the Stewart Tract so it is not subsiding like other areas within the interior of the Delta. Stewart Tract is also located in a low seismicity zone as designated by the State Department of Conservation.[2]

The Stewart Tract is surrounded by a Federal ring levee authorized by Congress in the Flood Control Act of 1946 as part of the much larger Sacramento River and San Joaquin River Delta Flood Control Project. The Stewart Tract is governed by two local Reclamation Districts, RD 2062 and RD 2107; see Figure 2. The Applicant, as the sole landowner, controls and governs RD 2062. The length of the RD 2062 levees is approximately 60,000 feet.

A significant portion of the RD 2107 area of the Stewart Tract is currently being mined for sand and is designated as an Area of Statewide Importance for aggregates. The RD 2062 portion of the Stewart Tract is being farmed and is also being developed as Phase 1 of the River Islands Project. The Phase 1 portion of the Project is protected by a recently improved levee system which provides a 200 year level of protection. Three freeways, including two in the Federal Interstate System, cross the Stewart Tract as do two national rail lines, a high voltage electrical transmission line, several fiber optic lines and regional water and sewer mains.

<u>Project Description</u>

The Project consists of three key components, each of which has independent utility from the others:

1. ***Flood Protection Component***: includes the flood protection infrastructure for the property upon which the Project is to be developed (the Project Site) as well as a concurrent habitat creation, enhancement and restoration program. The flood protection and habitat benefits will be achieved through the construction of setback levees, improvements to existing levees, and restoration and expansion of Paradise Cut flood bypass. The status of the construction of this component is as follows:

    - ***Existing Flood Protection***: The Stewart Tract levees are part of the Lower San Joaquin River Federal Project Levee system constructed in the 1950s. Approximately 900 acres of Phase 1 has been recently protected from a 200 year flooding event (as defined by the State of California Department of Water Resources) with the construction of super-levees (300 feet wide at the crown) and interior ring levees. Development is allowed on these super-levees 75 feet back from the hinge point of the

[2] Source: Probabilistic Seismic Hazard Assessment for the State of California, Department of Conservation, Division of Mines and Geology, 2003

waterside levee slope. The reconstructed levees have been certified by FEMA as providing a minimum 100 year level of flood protection. The entirety of Phase 1 (4,284 housing units and three million square feet of commercial space) can be built without additional Federal approvals. The balance of the Project is protected by 50-year levees but has received a Conditional Letter of Map Revision from FEMA for 100-year protection. (See Figure 3.) The Phase 2 development area could also be developed without Federal permits or authorizations as is more fully described in this report.

- ***Proposed Flood Protection Improvements***: The Applicant proposes to continue super-levee construction for the balance of the Project in order to provide a minimum 200 year level of protection. As with Phase 1, development would occur on the super-levee at an agreed upon distance back from the top of the waterside slope. The distance would address Federal and State requirements for levee maintenance and flood fighting capabilities.

  Phase 2 would also include improvements to the Paradise Cut bypass that would help restore the original design flow of the bypass and reduce current flood elevations for downstream urban areas. In particular, the Applicant proposes to remove accumulated sedimentation from a 40 acre "bench" that blocks the flow of water coming over the Paradise Weir. In order to avoid any increase in flood water elevation for third-party properties bordering Paradise Cut to the south, the Applicant proposes to set back levees along the north bank of Paradise Cut and enlarge the bypass area by approximately 250 acres. Remnants of the current levees will remain in place and be used to create high ground refugia for the endangered riparian brush rabbit that lives in Paradise Cut and that now gets flooded when Paradise Cut is inundated. The improvements in Paradise Cut would help restore the original design capacity of the bypass and reduce current flood elevations to downstream urban areas.

  It is contemplated that if the proposed improvements are not approved, the Project will still be developed in a different manner that does not require Federal permits. Because local entitlements are already in place for Phase 2, flood protection could be provided through an interior ring levee or through the creation of high ground areas that are elevated above the flood plain. In the event Phase 2 is built without Federal permits, the improvements to Paradise Cut and the creation of riparian habitat would not be built.

2. ***Private Development Component***: includes the development, on the Project Site, of a private development project consisting of approximately 11,000 homes and five million square feet of commercial and retail space with a variety of other community facilities and associated infrastructure. As noted above, Phase 1 is

currently being constructed and includes 4,284 of the units and three million square feet of the commercial space. Phase 1 does not require any additional Federal approvals.

3. ***Recreation Component***: includes the construction of water-oriented recreational facilities including boat docks and piers.

Project History

There is a long history of development plans for the Stewart Tract. The area has been planned for urbanization since the late 1980's and was designed to achieve several goals associated with flood control, infrastructure and urban development in the South Delta as further described below. In fact, even as early as the 1950s, the Corps contemplated that the Lower San Joaquin River Flood Control Project would provide flood protection to the South Delta**:**

1. ***The Project is endorsed by the City of Lathrop and satisfies Lathrop's General Plan Goals****:* The City of Lathrop incorporated in 1989. The City adopted its first general plan in 1991 and included Stewart Tract within its urban development boundary. The City subsequently annexed the development portion of the Stewart Tract to its corporate boundaries in 1997. The City approved specific plans authorizing urban development in 1996 and again in 2002. A first phase tentative map was approved by the City in 2003, with updates in 2005 and 2007 (Figure 4). All phases of the Project have been entitled by the City and construction of required infrastructure has commenced on the first phase of development which includes 4284 units of housing and three million square feet of commercial space.

   The City of Lathrop has finite boundaries and development of Stewart Tract is the only practicable alternative within the City for growth. As noted in the 404(b)(1) alternatives analysis, the City is "landlocked" by its vicinity to the cities of Manteca to the east, Stockton to the north, and the primary zone of the Delta to the west and the Stewart Tract provides the only contiguous tract of land available for the City to expand into and meet its ultimate fiscal needs.

   On a land use policy basis, the City found in its general plan that Stewart Tract enhanced the City's identity regionally, provided quality housing stock, would result in significant high paying employment opportunities, recreational opportunities in the Delta system and was vital to its economic well being.

2. ***The Project will generate much needed jobs and revenues for the region:*** San Joaquin County continues to lead the nation in housing foreclosures and high unemployment. A key element of the River Islands Project is the attraction of high quality employment opportunities not available elsewhere in the San Joaquin region. The Project is located at the junction of three major freeways and over 160,000 cars pass by the site daily, with approximately 60,000 commuters headed to employment opportunities in the San Francisco Bay Area. The Employment

Center district will provide up to 5 million square feet of office and research and development uses. Up to 17,000 new jobs are anticipated from the Employment Center; an unprecedented opportunity for a county that has historically suffered double digit unemployment rates. Creating jobs central to employee's homes is critical for employee morale, reduction in air and noise pollution and improvement in quality of life.

The development of Stewart Tract also would be a significant economic boon to the revitalization of the older areas of the City where revitalization is desired. The City does not have a redevelopment agency and must rely on other means in which to generate revenue for revitalization and redevelopment efforts. To this end, residential development in Stewart Tract will contribute $1,000 from every dwelling unit constructed (for a total of $11 million) that can be used at the discretion of the City to revitalize blighted areas of the City east of Interstate 5. An additional $4,000 per dwelling unit will contribute an additional $44 million in economic incentives for potential employers looking to locate within Stewart Tract, providing further direct economic benefits to the City and the region from the Project. These subsidies were mandated in a Citizen's initiative approved by the voters of Lathrop in the year 2000 and cannot be spent on anything but their intended use.

To our knowledge, this unique economic subsidy has not been implemented anywhere else in the State or even in the nation. Additionally, this subsidy not only targets job creation in the City of Lathrop but it has been coupled with zoning restrictions designed to encourage high job intensity development. In particular, the Employment Center zoning on the Stewart Tract strictly prohibits the development of industrial and warehouse space. Because Lathrop is located at the confluence of three major freeways and is an excellent central location for distribution throughout the state, the City has historically attracted large users of warehouse or distribution space that employ relatively few workers. The goal of the Employment Center on the Stewart Tract is to attract employers with a minimum of 40 employees per acre as is typical for urban office development. This type of employment is intended to generate head-of-household incomes.

3. ***In 1992, the Stewart Tract was included in the Secondary Zone of the Delta which allowed for urban development****:* Subsequent to the City's action to include Stewart Tract in its General Plan, the State allowed the urbanization of the Stewart Tract with the passage of the Delta Protection Act of 1992. The Act included the Stewart Tract in the legal Delta's Secondary Zone (Figure 5). The Secondary Zone of the Delta expressly allows urban development under the discretion of local land use agencies. Many of the surrounding cities are physically located in the Secondary Zone. By contrast, the Primary Zone of the Delta, which was also identified in 1992, cannot be developed. The Delta Protection Act designates the Primary Zone for agricultural land**.** In the heart of the Primary Zone, land is well below sea level and consists of heavy organic soils which cause subsidence. The Stewart Tract is 8-12 feet above sea level and has no peat/organic soil. As a result of the State's inclusion of the Project into the Secondary Zone, the Applicant invested significant funds into its further entitlement.

4. ***A significant portion of the Project is already outside the Base Flood Plain and it already meets a higher State standard for flood protection**:* FEMA standards require a 100-year level of protection to avoid the procurement of flood insurance. In the past, this has been the de facto standard for local governments to permit urban development. However, in 2008 the State of California passed legislation (SB 5 and others) that now requires cities to provide by the year 2020, a 200 year level of protection for urban development. Prior to the 2008 legislation, the Applicant proposed a 200 year level of protection and in fact, achieved that level of protection for the Phase 1 development area for which infrastructure is currently being built. The protection was achieved via the creation of super-levees which are approximately 300' wide at the crown. The applicant has proposed the construction of super levees for Phase 2 as well with the intent of achieving at least a 200 year level of protection for the entire Project. Please see Figure 6.

5. ***The Project Applicant worked with affected agencies to design a project that provides regional flood reduction benefits**:* The flood protection program designed for the Project was developed with the assistance of the surrounding reclamation districts. In particular, Reclamation District 17 (RD 17) asked that the Project Applicant help restore the design flow capacity in Paradise Cut in order to divert flood flows away from the urban areas of RD 17. Because Paradise Cut was not operating as was originally intended by the Corps, RD 17 asked that the Applicant remove the impediment at the weir and set back the Paradise Cut levees to accommodate the increased flow. These improvements were consistent with the goals and objectives of the Sacramento and San Joaquin River Basins, California, Comprehensive Study ("Comprehensive Study") which was developed by the Corps and the State in 2002. The increased diversion would provide direct benefits to adjacent upstream urban areas protected by RD 17, including portions of the Cities of Stockton, Manteca and Lathrop. The fact that the Project Applicant owned the land in Paradise Cut made this effort possible. While Paradise Cut improvements were a long time goal of the Corps and the State, no one entity actively pursued their implementation. RD 17 asked that the Project Applicant take on this role.

   It should be noted that extensive hydraulic analyses have been performed as part of prior CEQA analysis for the Project (UNET model) and as part of encroachment permit applications to the Central Valley Flood Protection Board (former State of California Reclamation Board) submitted for Phase 1 flood protection improvements (HEC-RAS model). Additional modeling, performed as part of the Risk and Uncertainty Analysis (R&U) required for the EIS is currently underway, but has not yet been reviewed by the Corps.

The improvements proposed for Paradise Cut also form the foundation for a larger bypass that is currently being analyzed by the Applicant and the Natural Resources Defense Council (NRDC) and Natural Heritage Institute (NHI). Although an unlikely alliance, the Applicant is working with the environmental groups to develop a plan for a significant regional flood reduction program. Initial modeling shows that additional improvements to Paradise Cut beyond those proposed for the development project, could result in a 20 inch reduction in river elevation during a 100 year flood event on the San Joaquin River at Mossdale. This reduction would essentially enable the urban areas along the San Joaquin River to achieve a 200 year level of flood protection without the need to raise levees along RD 17. It would also provide flood protection benefits upstream to large agricultural areas.

This broader program, if implemented, would be in addition to the Project flood protection improvements proposed by the Applicant. The Applicant's proposal for Paradise Cut will result in immediate localized flood reduction benefits in conjunction with the River Islands Project. The broader program would incorporate the Applicant's proposed improvements and expand Paradise Cut to the south in order to provide additional regional flood reduction benefits. The results are promising however they are preliminary and require additional analysis. The broader program would impact upstream Federal levees and inundate significant wetlands. While the Applicant actively supports the additional analysis, the broader program is not being proposed as mitigation for the River Islands Project and is not being considered in this Analysis. It is however, being considered programmatically in the EIS as a flood protection alternative.

6. ***The Project Applicant worked closely with U.S. Fish and Wildlife Service and other agencies to design extensive eco-system improvements:*** An important component of the Project is the restoration and creation of habitat areas for the endangered species currently located in Paradise Cut. Currently, when the Paradise Cut bypass flows with flood waters, the endangered riparian brush rabbit has no habitat to use to avoid flood waters. As a result, the brush rabbit is at risk from predators including coyotes and raptors. This problem was illustrated during the 2006 high water event where a number of brush rabbits were rescued when they fled to the levee in order to avoid flood waters and were exposed with no cover to predators. The Project would rectify this problem by leaving remnants of the existing levee after the setback levees have been built. These levee remnants would be vegetated and enhanced to create high ground refugia for the brush rabbit during flood flows. The Applicant has worked closely with the U.S. Fish and Wildlife Service (USFWS) to develop habitat features and has actively participated in the promulgation and protection of existing populations of brush rabbits in the Project Site with the USFWS. The Applicant will set aside over 600 acres of new and existing habitat to enable the creation of a sustainable rabbit population.

The Project also proposes the establishment of Shaded Riparian Aquatic Habitat along the San Joaquin River, and has designed other measures to improve the health of the river system for the Delta Smelt, Sacramento Splittail and other endangered fish species.

7. ***The proposed flood protection improvements are consistent with regional and multi agency planning efforts:*** The proposed levee improvements are consistent with several regional and multi agency planning efforts for the San Joaquin Delta. The October 2002 Draft Interim Report of a Comprehensive Study of the Sacramento River and the San Joaquin River Delta Levee System, issued jointly by the Corps and the State Reclamation Board (now Central Valley Flood Protection Board), states that levee integrity and habitat restoration are objectives of the agencies' project operations and maintenance efforts. Further the CALFED program, authorized by WRDA 2000; states that levee integrity and habitat restoration are two of the four principle objectives of the CALFED program. The River Islands proposal would establish a 200 year level of protection for the Stewart Tract, provide additional recreation and scenic amenities for the Project, enhance levee integrity and aid in the environmental restoration and endangered species recovery objectives of the Corps, USFWS, the National Marines Fisheries Service, California Department of Fish & Game, and CALFED.

8. ***The Applicant has identified a unique funding alternative to ensure adequate funding of maintenance and repair****:* Currently, when property owners adjacent to a levee perform activities that undermine the levee integrity, reclamation districts have to resort to legal action to stop the activity. The Project Applicant has identified an alternative to this cumbersome process. By forming a Geologic Hazard Abatement District (GHAD), which has full authority to enforce maintenance and safety standards, enforcement action is more timely and effective. The GHAD operates according to a Plan of Control which details maintenance standards. If an adjacent property owner violates these standards, the GHAD can take immediate action to correct the problem. The property owner must then reimburse the GHAD for the action taken. The GHAD also accumulates a financial "sinking fund" which will contain funding for catastrophic events. In addition to being funded directly by property taxes for maintenance, which will be established with adequate and increasing limits, the GHAD will have funding to immediately address problems caused by catastrophic events.

9. ***Phase 2 of River Islands can be developed without Federal permits or authorizations:*** By avoiding waters of the U.S. and associated wetlands, the Project could fully develop without obtaining Federal permits or authorizations. The Project developer owns the entirety of the site in fee, has obtained potable water for buildout of the Project, has acquired the necessary local entitlements and has the ability to construct a modified project that would maintain the same intensity/density of the proposed development, but avoids all delineated wetlands. While buildout of the Project is possible, it would <u>not</u> include any of the regional

flood protection, eco-system restoration and creation, recreational opportunities and other benefits that the proposed Project offers.

<u>Summary of Executive Order 11988</u>

Executive Order 11988, (EO 11988) signed May 24, 1977, sets development policy for all water resources agencies, including the Corps, and establishes as a Federal objective: (1) the avoidance, to the extent possible, of long-and short-term adverse impacts associated with the occupancy and modification of the base floodplain; and (2) the avoidance of direct and indirect support of development in the base floodplain wherever there is a practicable alternative. The base floodplain is defined as the one percent chance floodplain (also known as the "100 year flood plain").

ER 1165-2-26 states that under EO 11988, the Corps is required to provide leadership and take action to:

1. Avoid development in the base floodplain unless it is the only practicable alternative;
2. Reduce the hazard and risk associated with floods;
3. Minimize the impact of floods on human safety, health and welfare; and
4. Restore and preserve the natural and beneficial values of the base floodplain.

Because a portion of the proposed Project is located within the 100-year flood plain, this Compliance Analysis seeks to provide the factual basis to assist the Corps in making the above findings and providing additional support information in the preparation of the River Islands EIS.

<u>Compliance with Water Resources Council Guidelines</u>

In February 1978, the Water Resources Council (WRC) issued *Floodplain Management Guidelines for Implementing Executive Order 11988*. These guidelines provide analysis of the Executive Order, definitions of key terms, and an eight-step decision-making process for carrying out the Executive Order's directives. The process contained in the Water Resources Council guidelines incorporates the basic requirements of the Executive Order.

The eight-step process is briefly outlined below, followed by a detailed s discussion of how the Project can demonstrate compliance with the WRC Guidelines.

Step 1: Determine if a proposed action is in the base floodplain (100-year floodplain or 1% chance flood or 500-year or 0.2% if the action falls under the definition of critical, discussed separately below). The proposed Project is currently within the 100-year floodplain and as described in this document, will be achieve 200-year protection through the Applicant's flood protection program. The proposed action would not be deemed as a "critical action" as explained in the matrix below:

Criterion	Applicability to Project
The minimum floodplain of concern for certain critical actions is the area subject to inundation from a flood having a 0.2% chance of occurring in any given year (500-year floodplain).	The Project, the City of Lathrop and in fact most of the region surrounding the Project is subject to inundation from a flood having a 0.2% chance of occurring in any given year and is within the 500-year floodplain. However, this criterion is not a stand-alone test for determining critical action; the determination of critical action is based on the nature of the action in combination with susceptibility to a 500-year flood.
Critical actions are those for which even a slight chance of flooding would be too great. Critical actions include activities that create, maintain, or extend the useful life of those structures or facilities indicated in the following questions.	The improvements proposed with the Project are not activities for which even a slight chance of flooding would be too great. One of the main purposes of the Project is to improve flood protection and withstand flooding for the proposed development area; as such, the Project overall is not sensitive to flooding.
1. If flooded, would the proposed action create an added dimension to the disaster as could be the case for liquefied natural gas terminals and facilities producing and storing highly volatile, toxic, or water-reactive materials?	No; the proposed action (the Project) does not involve the types of facilities noted in the criterion. The Project would not contribute to an added dimension of disaster but rather would provide additional protection from flooding and would mitigate the disaster hazards noted in the criterion.
2. Given the flood warning lead-time available, would the occupants of buildings such as hospitals, schools, and nursing homes be insufficiently mobile to avoid loss of life and injury?	No; the Project would increase flood protection for the Project site, as well as regionally and reduce potential for loss of life and injury. Further, only schools are currently proposed for the Project site; however, any occupancy sensitive structure can easily evacuate to higher ground areas of the Project site and beyond as necessary, since flooding events in the San Joaquin River system typically occur over many hours or days.
3. Would essential and irreplaceable records, utilities, and/or emergency services be lost or become inoperative if flooded?	No; the Project does not involve the types of facilities noted in the criterion. The Project would not place irreplaceable records, utilities, and/or emergency services at risk to be lost or become inoperative but rather would increase protection from flooding and decrease susceptibility to flooding.
If the answer to one of questions 1 through 3 is "yes," an alternative location must be sought completely outside the larger floodplain.	

To summarize, as noted in the Floodplain Management Guidelines, a critical action is "any activity for which even a slight chance of flooding is too great." This definition is intended to apply to Federal actions where that action would involve facilities or infrastructure that are sensitive to flooding, where the consequences of flooding would be severe in terms of ability to provide essential community services or to protect life and welfare (as described in the criteria above). Under the Project, it is the levee improvement program itself which will reduce the chance of flooding, rather than being sensitive to or compromised by flooding; i.e., its purpose is to manage flood risk. Therefore, the Project is not considered a critical action because they are intended to withstand flood conditions, reduce flood risk, and increase flood protection.

Step 2: Provide public review. The Project has undergone extensive public review as part of the City of Lathrop's permit review and CEQA level review processes. Further, under the proposed EIS process, the USACE will conduct relevant and appropriate public review of the Project.

Step 3: Identify and evaluate reasonable and feasible alternatives to locating in the base floodplain. The Applicant has completed an Alternatives Analysis as required under Section 404(b)(1) and has determined that there is no practicable on-site or off-site alternative for the proposed Project; see Appendix A. The pending EIS will also include an alternative analysis as required by NEPA and will identify reasonable and feasible alternatives if such alternatives exist.

Step 4: Identify the impacts of the proposed action. The Project was analyzed under the City of Lathrop's 2003 Subsequent EIR for the River Islands development project and two subsequent addendums. These documents included relevant impact analyses for a number of issues, as well as appropriate mitigation measures. It is also the main subject of the USACE's pending EIS and any environmental effects potentially resulting from the Project, including review under the Endangered Species Act, Clean Water Act, Clean Air Act, and other Federal environmental regulations will be included in this EIS.

Step 5: Minimize threats to life and property and to natural and beneficial floodplain values. Restore and preserve natural and beneficial floodplain values. The Project proposes to reduce flood risk and increase protection for life and property within the Project site and the region. The existing levee system was originally designed to provide for only a 50-yeear flood event. The Project flood protection improvements will increase and maintain the level of protection beyond that of the base flood to a minimum 200-year protection (0.5% chance). Another large component of the project is the enhancement, creation, and preservation of habitat and other eco-system embellishments within Paradise Cut, including the setting aside of 600 acres for the Riparian Brush Rabbit.

Step 6: Reevaluate alternatives. As mentioned, a 404(b)(1) Alternative Analysis has already been performed for the Project which provided a full analysis of off-site and on-site alternatives. As part of the EIS process a reevaluation of these and other alternatives will be performed.

Step 7: Issue findings and a public explanation. To conclude the NEPA process, a Record of Decision will be publically issued following the publishing and processing of the Final EIS.

Step 8: Implement the action. The Applicant intends to begin construction of the flood protection portion of the Project within several years after a favorable Record of Decision.

In summary, the Project would reduce the risk of flood loss and minimize the impact of floods on human health, safety, and welfare by improving existing flood management infrastructure, and would increase protection for both existing and proposed urban development. Because there is no reasonable and feasible alternative to the urban development indirectly associated with the Project and because the actions will improve flood protection and at the same time provide important regional environmental and recreational benefits, the Project satisfies the Eight Step process as provided by the WRC for compliance with Executive Order 11988.

Compliance with General Policy as Defined by ER 1165-2-26

In addition to the WRC Guidelines described above, the Applicant has designed the Project to comply with the general procedures governing the implementation of EO 11988 and to take into consideration the needs and welfare of the public. The reasons are set forth below and are in the order listed by ER 1165-2-26:

1. Avoid development in the base floodplain unless it is the only practicable alternative.

   Upon implementation of the flood control proposal, the entire development area of the Project will be removed from the 200 year flood plain. However, EO 11988 states that development should be avoided unless it is the only "practicable" alternative. Practicable means capable of being done within existing constraints. The test of what is practicable depends upon the situation and includes consideration of many factors such as environment, cost, technology or legal authorities. For the following reasons, the proposed development is the only practicable alternative:

   1-A. The 404(b)(1) analysis which was prepared for the River Islands EIS finds no practicable alternatives to the proposed project. A number of alternatives to the Project were studied in the 404(b)(1) analysis and none were found practicable; see Appendix A for the complete 404(b)(1) analysis. Some of these alternatives are described as below.

   - ***The No Federal Permits ("No Action") Alternative still results in urban development but does not achieve the Project Purpose or provide eco-restoration and flood reduction benefits.*** The No Federal Permit Alternative would avoid wetlands and other waters of the U.S. by concentrating development on the Stewart Tract to the north and east where elevations are higher than other areas where more fill or extensive flood protection would otherwise be required. The existing pond, central drainage ditch and Paradise Cut would be avoided in its entirety and no alterations to the existing levee system would occur. Instead, a new levee system, connected to high ground corridors would be built to FEMA 100 year level of protection standards for urban development, and would be constructed at least 10 feet from the existing Federal project levee system. In order to build this interior system, fill would come from the internal lake system, which would still achieve a cut/fill balance since the interior levee system would utilize significantly less fill material than proposed super-levees with the proposed Project, since the interior levee system need only be a minimum of twenty (20) feet in crown width by standard and can be widened if necessary to meet through and underseepage requirements. Such a levee section would be considerably less wide than the three-hundred foot (300') wide superlevees. This alternative would avoid Federal authorizations and permitting and no Central Valley Flood Protection Board encroachment permits would be necessary.

Since the physical footprint of this No Action alternative would be virtually the same as the proposed Project's (about 20 acres less), the same level of urban development result. From the economic, technical and logistical points of view, the No Action alternative is practicable. However, the 404(b)(1) analysis concluded that this alternative would not be practicable, since it would not meet the overall project purpose and would not meet the established criterion for environmental benefit, including the eco-restoration benefits afforded by the Paradise Cut improvements. Also, regional flood protection benefits afforded by the proposed Project would not be realized with this alternative, including the lowering of flood stage in the San Joaquin River. Since the riparian and other habitats for threatened and endangered species, such as the high ground refugia for the riparian brush rabbit, would not be realized, the No Action alternative was rejected.

It should be noted that while the No Action Alternative was rejected from a 404(b)(1) perspective, it is viable development alternative for the Applicant and would likely be built in the event that the Corps denies the proposed jurisdictional improvements. The Applicant owns all of the site area, has acquired all the potable water rights for the buildout of the Project and will likely proceed with a modified project if required.

- ***The On-Site Avoidance and Minimization Alternative still results in urbanization but is not financially feasible and would not provide eco-system benefits.*** The On-Site Avoidance and

Minimization Alternative involves the same building envelope as the proposed Project but avoids impacting the central drainage channel. This alternative would eliminate approximately 50 acres which was identified as part of the central lake. The 50 acres represent a significant portion of the fill material required for the flood protection program and would result in the requirement to import a significant amount of fill. While this alternative met some of the screening criteria in the 404(b)(1) analysis, it was deemed impracticable due to its infrastructure costs. In particular, in order to avoid the central drainage channel, the area would need to be spanned by a series of bridges. It is estimated that at least 10 bridges would need to be constructed and all utilities would either need to be lifted over the channel, or be bored under the channel. In addition, due to the loss of fill material, approximately 7 million cubic yards of fill would need to be imported to balance the project site. In addition, sales values would be reduced significantly due to the fact that there are 50 less acres of lake which would reduce the amount of units that would front the lake and would reduce potential premiums that are necessary to offset Project costs and generate necessary revenues for municipal operations.

Additionally, since this alternative does not involve Paradise Cut, like the alternative before it, it does not have the potential to provide regional flood reduction benefits or any of the eco-restoration benefits that are provided by the proposed Project.

- ***The Elevated Pads Alternative is not technologically feasible nor does it provide eco-system benefits***. This alternative would provide high ground areas for urban development above the base flood elevation of +18 NGVD. Under the City of Lathrop's Floodplain Management Ordinance, such subdivisions are allowable when new structures maintain an elevation at least one (1) foot above the base flood elevation. No improvements to Paradise Cut or the existing levee system would be necessary to provide sufficient flood protection for structures; however other essential structures (such as pump stations and electrical equipment) may not be able to be flood protected without a levee system. This alternative would also not provide a continuity of land uses necessary for a mixed use project (such as the Town Center and Employment Center). Due to the "hop scotch" nature of this alternative, the inability to provide a continuity of land uses necessary to create a true mixed use community makes the feasibility of retail and employment generating uses nebulous. The expense of raising the 300+ acre employment center out of the flood plain would be cost prohibitive and as a result, it is doubtful that this alternative could produce a regional employment center to generate the revenues and jobs for the region and to offset existing and future infrastructure costs necessary to make the Project feasible.

As with the other alternatives described above, this alternative does not involve any areas of Paradise Cut or affect identified aquatic and terrestrial habitat resources of the San Joaquin or Old Rivers since it does not need the improvements in this area in order to flood protect the site. Therefore, this alternative does not have the potential to provide regional flood reduction benefits or any of the eco-restoration benefits that are provided by the proposed Project. Additionally, any recreational opportunities in the external river system, including the backbay on the San Joaquin River which provide both eco-restoration and recreation benefits would not be realized.

- ***The 1996 West Lathrop Specific Plan Alternative is not fiscally or logistically feasible, nor does it provide eco-restoration or flood reduction benefits.*** This alternative studies the former project once proposed for the Stewart Tract approved with the 1996 version of the West Lathrop Specific Plan (WLSP). The original project included three theme parks, one water park and 8,500 residential units. Under this alternative, the existing levee system would not be relocated or breached, only reinforced and made higher in some areas. No additional improvements to Paradise Cut would be provided as proposed with the Project.

  This alternative was found to be infeasible due to its high infrastructure costs as well as the unlikely probability of successfully building and operating a destination theme park and resort in this area. This alternative cannot produce revenues similar to those of the proposed Project. In addition, the inability to provide a continuity of land uses necessary to create a true mixed use community and the infeasibility of the destination resort uses brings the feasibility of complementary retail and employment generating uses into question as well.

  As with the other alternatives, since this alternative does not involve Paradise Cut it does not have the potential to provide regional flood reduction benefits or any of the eco-restoration benefits that are provided by the proposed Project.

1-B. The location of the Project next to the Paradise Cut bypass makes it the only Practicable Alternative for achieving regional flood reduction benefits by setting back levees without impacting normal hydrology. Because the Project is located adjacent to an existing flood control bypass, the Applicant can make improvements to the bypass without affecting the normal hydrology of the surrounding river system. Because Paradise Weir only overtops during flood flows, setting back levees in the bypass would not affect the elevation of the surrounding rivers during non-flood events. There is no water flowing into Paradise Cut during non-flood events so the setback levees would be irrelevant to normal hydrology. When water does flow into the bypass during floods however, the levee setbacks will accommodate the additional water and benefit the main channel.

In contrast, if the Applicant proposed to set back levees along a section of the main channel of the river, the setback would result in an overall lower water elevation for that section of the river during all flows. It would benefit the main channel during flood events but would also impact the elevation of the river during normal flows. Given existing problems with dissolved oxygen downstream of the Project, any lowering of river elevation during normal hydrology would be a detriment to the region.

This locational advantage is the primary reason that development of the Project will allow for regional flood benefits without the detriments associated with changing normal hydrology.

1-C. The location of the Project within the City of Lathrop and adjacent to the intersection of three state wide freeways, allows the City to achieve its General Plan Goals. The City of Lathrop is constrained geographically. It is bounded on the west by the Primary Zone of the Delta, on the east by the City of Manteca and on the north by the City of Stockton. Without the Project, the City cannot meet its goals for long term growth and the City has relied on the Stewart Tract for its jobs and revenue base since 1989 when the area was first included in the City's General Plan.

San Joaquin County has historically high unemployment rates and some 60,000 citizens commute to jobs outside the area. In 2000, the citizens of Lathrop voted to impose unique economic subsidies on River Islands (up to $55 million) to fund incentives for employers to locate in the five million square foot Employment Center. This subsidy only applies to the Rives Islands site (See Project History Section above) and will not be collected elsewhere in the City or the region. The Project also faces restrictions on zoning against warehousing and industrial use which will require the Center to contain only high intensity employment uses which maximize the number of employees per acre. The Project location coupled with the unique voter-approved subsidies make it the only practicable project for achieving city and regional employment goals.

1-D. The location of the Project adjacent to an endangered species habitat allows the development of critical high ground refugia to reduce the

flood threat to the riparian brush rabbit. Paradise Cut contains one of only three known populations of the endangered Riparian Brush Rabbit. The adjacency of the Project to the existing habitat makes it possible to create a sustainable area for rabbit re-population. Projects not located next to a sensitive habitat would not have the opportunity to restore the habitat and more importantly provide improvements to the habitat areas to protect it from flooding events. The Project will provide critical high ground refugia for the species by vegetating and bridging levee remnants as the proposed setback levees are constructed. As discussed previously, high water events like those that have happened in the past (April 2006 event) have the potential to negatively impact existing rabbit populations by forcing rabbits to barren, un-vegetated levees that provide no cover to the rabbits from natural predators. The provision of high ground refugia is a unique feature of the Project that helps to reduce mortality rates of the species during a flooding event. The location of the Project adjacent to the rabbit habitat makes it the only practicable alternative for sustaining the rabbit population.

1-E. Because the Project controls the land within the Bypass, proposed Project improvements can protect critical infrastructure of statewide significance. The project location and the control of the land uses by this particular Applicant can result in flood reduction improvements that can help protect significant infrastructure that is currently at risk of flooding. The Stewart Tract contains the intersection of three major freeways. It includes two interstate rail lines, fiber optic lines and major electrical infrastructure. By helping to restore the design capacity of Paradise Cut, the threat of flooding on the Stewart Tract is lessened. See Figure 7.

The improvements will help reduce the threat of flooding for significant regional infrastructure that is critical to the transport of goods and services in the state. The flood reduction improvements will also help reduce the chance of flooding in downstream urban areas. In particular, over 5,000 existing homes in the City of Lathrop will have a reduced chance of flooding because of the Project's proposals.

2. <u>Reduce the hazard and risk associated with flooding.</u>

The Project has been designed to reduce the risk of flooding and to reduce the hazards when floods do occur.

2-A. The proposed Project includes resilient and robust flood control infrastructure elements. The proposed project includes setback levees and the creation of 300 foot wide crowns for levees to provide a 200 year level of protection. The setback levees will be located adjacent to the Paradise Cut bypass. Along the Old River portion of the Project, the existing levees will be reconstructed in their current location and widened to 300 feet. A 300 foot crown is 15 times wider than the current requirement for crown width. Historically, this area of the Delta has flooded as a result of underseepage and boils and not from over-topping. The wider levee crown will minimize the potential for rodent holes and tree roots to undermine the structural integrity of the levees. Figure 8 depicts the improvements proposed.

The proposed levee improvements also provide regional flood protection benefits beyond the Project Site. The proposal provides value to downstream urban areas along the San Joaquin River by shifting flood flows away from the urban areas and into the Paradise Cut bypass. The areas that benefit include the cities of Stockton, Manteca and Lathrop. The proposed improvements also provide benefits to levees owned and operated by RD 17, RD 2058 and RD 2095 which the Corps has identified as having unacceptable maintenance ratings

2-B ***The Project design will accommodate future levee raising.*** The width of levee crown will allow for future raising if necessary. Global climate change may result in higher water elevations than what is currently assumed. Current modeling for the Project has contemplated a sea level rise of 36 inches. If the future results in higher river elevations, the levees could be raised within the crown area to accommodate the additional water elevation.

2-C. ***Project will exceed current engineering standards***. The proposed flood control improvements will meet all Corps criteria and regulations. They will not only meet current Corps standards for under-seepage and height requirements but will also take into consideration seismic issues associated with levee construction. Although the Project is located in a low seismic area, levees have been designed to withstand 200 year flood events assuming concurrent earth movement. Improvements will provide at least a 200 year level of protection.

2-D. ***A more effective maintenance and enforcement entity will help protect newly constructed improvements.*** Normally levees are maintained by a reclamation district which can only enforce operational standards through litigation. The Applicant is proposing to create a Geological Hazard Abatement District (GHAD) which would have stronger enforcement mechanisms under the laws of the State of California and which can create a catastrophic fund for emergency purposes. The GHAD can fix levee problems without seeking individual homeowner permission and can fine or lien a property which is not in compliance; this is a much higher level of enforcement that what a typical reclamation district or even a city can impose. The GHAD will impose sufficient on-going taxes to ensure that all future maintenance is adequately funded.

2-E. Restoration of the Corps' original design flows for Paradise Cut is critical to the regional flood damage reduction program. The Project proposes to help restore the original design flow of the Paradise Cut bypass. Since the Corps constructed the bypass in 1955, the bypass has not operated at the capacity it was originally designed for. It does not divert the amount of flood flows off the San Joaquin River that it was originally designed to do. Over the years, siltation in both the channel bottom and more importantly, near the Paradise Weir (Figure 9) has changed the flow split, reducing the diversion of flood flows into the Paradise Cut. The proposed Project includes provisions to restore the design flow split by removing the sedimentation and setting back levees from 200 to 900 feet along the northern Paradise Cut levees which will increase the size of the bypass by 250 acres. Restoring the flow split will help to alleviate pressure downstream along the urban areas adjacent to the San Joaquin River and not result in negative affects to downstream agricultural areas. Extensive modeling has been done for this proposal and modeling completed as part of the EIS analysis shows that during the recent 1997 flood event, at all times the urban areas downstream of the Project would have been better off if the proposed Project improvements were in place than they actually were without the improvements.

Restoring the capacity of Paradise Cut will result in a more robust and resilient regional system. The Applicant owns the land within Paradise Cut adjacent to RD 2062. Paradise Cut is not located within any reclamation district and therefore it is not being maintained by any public agency at this time.

3. <u>Minimize the impact of floods on human safety, health and welfare.</u>

Flood protection improvements have been designed to be robust and resilient. However, in the event a flood does occur the Project has been designed to minimize the impact on human safety, health and welfare:

3-A. The Project has internal lakes designed to accommodate the 100 and 200 year storm events. The Project will contain a 350 acre internal lake. The lake is sized to accommodate internal run off for a 100 year storm event. However, development adjacent to the lake will occur several feet above the 100 year level so that the lake may rise and spread to overflow areas during a 200 year storm event without causing flooding to any of the structures.

Due to the width of the levee crown, it is likely that a flooding event from external rivers would be a result from overtopping and not underseepage. As noted above, this area of the Delta has not historically flooded as a result of overtopping. It has flooded as a result of underseepage and through-seepage which the wider crown will help to minimize. However, given future changes in the climate, if overtopping were to occur, the river water would be contained in the lake and pumped out when waters recede if necessary. A portion of the private cross levee (1,500 linear feet) would act as an interior weir during a 200 year event, allowing flood waters to crest over the levee top and be captured by the internal lake system, but provide full 100 year protection in all other cases. This operation would be managed by the GHAD whose sole responsibility is to protect the life and safety of the Project. In this type of flooding event, building pad elevations would be high enough to prevent damage to structures and flood waters would be drained quickly after they receded.

3-B. ***The Project has been designed with a high ground perimeter system which is elevated above the 200 year flood elevation***. The high ground perimeter (created with the construction of the super-levees) can provide an easily accessible location for immediate evacuation of lower elevation areas internal to the Project site that are more likely to be flooded. The high ground perimeter will be a minimum of 3 feet above the 200 year flood elevation and will be connected to all bridges that exist or will be built with the Project as mentioned below. This provides a quick and effective evacuation route for Project residents should a flooding event occur.

3-C. ***Bridges are being built at grade on the high ground perimeter to provide a quick and safe evacuation route to areas outside the project.*** All bridges within the Project Site are or will be built at-grade to the high ground perimeter which allows quick evacuation in the event of a flood. This allows for the evacuation route to maintain an elevation at least 3 feet above the 200-year flood event, so residents in lower lying areas have only a short distance to travel from inside the Project Site to the high ground perimeter the encircles the development and to the at-grade bridges to evacuate the site. Safe access to the bridges will help minimize the impact on human safety, health and welfare and will facilitate complete evacuation of the low lying areas.

3-D. ***The Project design helps to minimize the impact of floods on surrounding area***. Reclamation District 17 is located immediately north and east of the Project. The Mossdale area, located across the San Joaquin River from the Project is located in RD 17. If a levee were to breach in the Mossdale area, the Mossdale residents would be cut off from access roads and from the freeway for evacuation. Some 3,200 homes are planned for Mossdale and residents would be separated from the freeway during a flood. Because the Project will build bridges at grade to the levees, in the event of a levee failure near Mossdale its residents can access their own levees and evacuate to the River Islands Project. It should be noted that the existing RD 17 levees are designed to protect against a 100 year flood.

3-E. The Project will help to finance surrounding area flood improvements. The proposed Project will contribute funding to other levee systems that are off-site, but in the vicinity of the Project. The Project is within RD 2062, which is a member agency of the South Delta Water Agency (SDWA). SDWA is a coalition of 17 reclamation districts in the South Delta area. As a consideration for development on the Project Site, all new development in River Islands will contribute funding each year to help maintain the regional levee system to the benefit of SDWA. At build out, River Islands will contribute over $110,000 annually to maintain the surrounding levee systems. This is a significant sum given that several rural districts in the area spend less than $2,000 per levee mile for maintenance in total annual expenditures. Rural districts such as these have historically lower maintenance budgets than urban districts that have a greater ability to generate revenue.

In the event of a flood in a district located within SDWA, these funds can be used to help with evacuation and assistance programs for its residents and livestock.

4. Restore and preserve the natural and beneficial values of the base floodplain.

A major component of the Project is to enhance eco-systems while restoring the service of the existing floodplain. The Project does this by implementing the following improvements:

4-A. The proposed eco-system improvements facilitate Federal, State and Regional objectives. The proposed eco-system restoration, enhancement and preservation activities of the Project facilitates conservation objectives, contributes to fish and wildlife habitat values, and provides opportunities for conservation and restoration of endangered and threatened species in accordance with the goals of the Comprehensive Study.[3] The Applicant has worked closely with NMFS and the USFWS on the improvements.

In addition to the high ground refugia areas created for the riparian brush rabbit described previously, over 600 acres of habitat lands will be created, preserved or enhanced as a result of the proposed Project.

The oversized levee system around Old River and the San Joaquin River create an opportunity for shaded riparian aquatic habitat (SRA) along the waterside of the existing levee system in a manner consistent with Federal and State guidelines. The San Joaquin and Old Rivers are home to the

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[3] Page 83, Sacramento and San Joaquin River Basins Interim Report Comprehensive Study, California December 20, 2002

endangered Delta Smelt and Sacramento Splittail. Because of the extreme width of the proposed levees, tree roots and other plants would not impair the structure of the levee system and may comply with the Corps new vegetation standards.

4-B. ***The proposed improvements will create a meandering channel and increase flood storage.*** By constructing setback levees along Paradise Cut from 200 to 900 feet from the existing Federal project levees, a new meandering channel will be created with calm water back bays. These backbays provide excellent opportunity for shallow water habitat that can benefit fish species that need resting areas away from the fast flowing main channels. Besides providing recreational opportunities, the increased channel width will allow for additional flood storage.

4-C. ***The enlarged Paradise Cut bypass will increase tidal influence and help improve water quality.*** An additional 250 acres of water surface will be added to Paradise Cut. Since Paradise Cut is tidal, the increased basin will result in larger volumes of water moving in and out of the area. This additional water will "flush" the stagnant water and help improve water quality for fish populations in the area while providing a more natural edge to the slough channel.

4-D. ***The Project will help to restore original Army Corps flood flows for Paradise Cut.*** When constructed in the 1950's for the Corps, Paradise Cut had a design flood flow of around 15,000 cfs. Over time, sedimentation in the Cut, along with riparian and other woody vegetation has reduced the flood capacity of Paradise Cut to less than 13,500 cfs. New setback levees will allow for more flood storage and flood flow and will create the opportunity for high ground refugia for the riparian brush rabbit.

Conclusion

While the No Action Alternative as described herein is a viable development alternative for the Applicant and the No Action Alternative would likely be built in the event that the Corps denies the proposed jurisdictional improvements, the proposed Project is the only practicable alternative for the development that results in regional benefits. It will result in regional flood reduction benefits and significant improvements to the eco-system with the proposed Paradise Cut Improvement Project and the creation of Shaded River Aquatic Habitat along Old River and the San Joaquin River. The flood protection infrastructure will be designed to be both resilient and robust and will help reduce the threat of flooding. Implementation of the proposed Project will result in flood reduction benefits which will reduce hazards and minimize the risks to human safety and welfare. The Project has been designed to restore and preserve natural habitat.

With respect to the occupancy of the floodplain, the River Islands Project would avoid and minimize the effects due to floodplain occupancy by taking the development out of the floodplain via the creation of 300-foot wide levees that protect against the 200 year storm event. The development, as proposed, would restore and enhance the functioning of the original 1955 flood control system so that it performs better and more importantly benefits the region.

For the reasons set forth above, we, the River Islands Applicant, firmly conclude that the Project is consistent with the EO 11988.