

# Emergency Action Plan (EAP)

For

## Santiago Creek Dam Orange County, California

5305 E Santiago Canyon Road

Orange, CA 92869

Latitude: 33.7863; Longitude: -117.7252



### Dam Owners:

**Irvine Ranch Water District and Serrano Water District**

DSOD South Region

DSOD Dam No. 75.000

National Inventory of Dams (NID) No. CA00298

Federal Energy Regulatory Commission (FERC) No. N/A

**Copy    of 40**

Date Prepared: March 7, 2022

Prepared By: Stetson Engineers Inc. (760)730-0701



*Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com*

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# Dam Contact Information

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## **Santiago Creek Dam**

**24-Hour Emergency Contact: Wendy Chambers, Executive Director of Operations**

**Dam Owner:  
Irvine Ranch Water District**

**Serrano Water District**

**Dam Operator: Ken Pfister, Water Operations Manager, Irvine Ranch Water District**

**EAP Coordinator: Steve Choi, Director of Safety and Security**

*Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com*

# Key Dam Information

## Dam Description

Height:	136 feet	DSOD #:	75.000
Year Built:	1933	NID #:	CA00298
Dam Operator:	Ken Pfister, IRWD	Hazard Classification:	Extremely High
Dam Owner:	IRWD and SWD	Property Owner:	County of Orange and SWD



## Potential Impacted Area

The Santiago Creek Dam is located at the northwest end of Irvine Lake on unincorporated land in Orange County, CA. The terrain surrounding the dam is hilly and steep, with elevations ranging from 780 feet at the reservoir to 5,600 feet in the Santa Ana Mountains. The potential inundation area extends down to sea level at the Pacific Ocean. If the Santiago Creek Dam were to fail, the following jurisdictions could be affected:

County of Orange (un-incorporated areas)*	City of Tustin	City of Irvine
City of Orange	City of Westminster	City of Newport Beach
City of Villa Park	City of Fountain Valley	City of Seal Beach
City of Garden Grove	City of Costa Mesa	
City of Santa Ana	City of Huntington Beach	

\*including Community of North Tustin

## Directions to Santiago Creek Dam

In order to access the Santiago Creek Dam from the south, take CA-261 N to E Santiago Canyon Road, turn northwest onto E Santiago Canyon Road, and follow it for approximately one mile until Jamboree Road. Head north on Jamboree Road, and turn right on Irvine Park Lane. Continue east on Irvine Park Lane as it turns into Peters Canyon Road, and continue east on Peters Canyon Road until it reaches Santiago Creek Dam.

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# PART I: EAP INFORMATION

# Section 1: Introduction

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## 1.1 Background

Irvine Ranch Water District (IRWD) is an independent special district that serves 447,000 residential customers in central Orange County, CA. IRWD owns and operates five jurisdictional dams, one of which is the Santiago Creek Dam at Irvine Lake. Santiago Creek Dam is jointly owned by Serrano Water District (SWD) and IRWD. The dam is located in an unincorporated area of Orange County, California. The spillway is not considered a critical appurtenant structure by California's Division of Safety of Dams (DSOD) but was included in DSOD's 2017 list of spillways for re-evaluation. The drainage area upstream of the dam is 63.2 square miles. Irvine Lake is filled by natural runoff during the rainy season. Villa Park Dam, a jurisdictional dam owned by Orange County Public Works (OCPW), is located downstream of Santiago Creek Dam. A sudden and total failure of the Santiago Creek Dam may lead to a sequential failure at Villa Park Dam downstream. The inundation maps prepared in Part II of this Emergency Action Plan (EAP) are based on a sequential failure analysis for both dams.

The Santiago Creek Dam is an earthen dam originally constructed in 1933. The California State Dam Number is 75.000 and the National Dam Number is CA00298. The dam has a curved spillway crest which empties into a concrete-lined chute. The chute connects to an energy dissipater which then empties into a concrete channel. In addition to the spillway, Santiago Creek Dam has an outlet tower that discharges into a 60-inch diameter welded steel pipe which splits into two pipes at the downstream toe of the dam. The two pipes are 36-inch for regular conveyance and 30-inch for emergency releases.

The dam is located in the Santa Ana River watershed in hills about 15 miles inland from the Pacific Ocean. Topography in the area is steep, with elevations ranging from about 780 feet to 5,600 feet above sea level. Flooding from a failure at Santiago Creek Dam has the potential to inundate portions of the following communities:

- County of Orange<sup>1</sup>
- City of Orange
- City of Villa Park
- City of Garden Grove
- City of Santa Ana
- City of Tustin
- City of Westminster
- City of Fountain Valley
- City of Costa Mesa
- City of Huntington Beach
- City of Irvine
- City of Newport Beach
- City of Seal Beach

In total, thirteen jurisdictions could be affected, including one county and twelve cities.

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<sup>1</sup> North Tustin is a census-designated place and is part of unincorporated County of Orange.

*Figure 1-1 Santiago Creek Dam Reservoir Area Overview* shows the location of Irvine Lake, Santiago Creek Dam, Villa Park Dam, and the above-listed communities. *Figure 1-2 Vicinity Map* shows the vicinity downstream of the dam. Santiago Creek Dam impounds Irvine Lake along Santiago Creek, which is tributary to the Santa Ana River. The drainage area upstream of the Santiago Creek Dam is 63.2 square miles. Downstream of Santiago Creek Dam, Santiago Creek flows northwest for roughly 3.5 river miles, where it is impounded by Villa Park Dam. The drainage area between Santiago Creek Dam and Villa Park Dam is approximately 20.2 square miles. Downstream of Villa Park Dam, Santiago Creek flows through the Santiago Creek Recharge Basins and then continues for another 5.5 river miles before joining the Santa Ana River. At its point of discharge into the Santa Ana River, Santiago Creek drains a total area of 99 square miles. The Santa Ana River drains a total of 2,650 square miles, and flows into the Pacific Ocean.

Adjacent to the Santa Ana River watershed to the south is the San Diego Creek watershed. San Diego Creek is highly channelized and flows into Upper Newport Bay, draining roughly 120 square miles. Newport Bay is a large estuary and harbor which is influenced by ocean tides. The total drainage area of Newport Bay is about 150 square miles.

Flooding from a failure at Santiago Creek Dam has the potential to affect communities within the Santa Ana River and San Diego Creek watersheds.



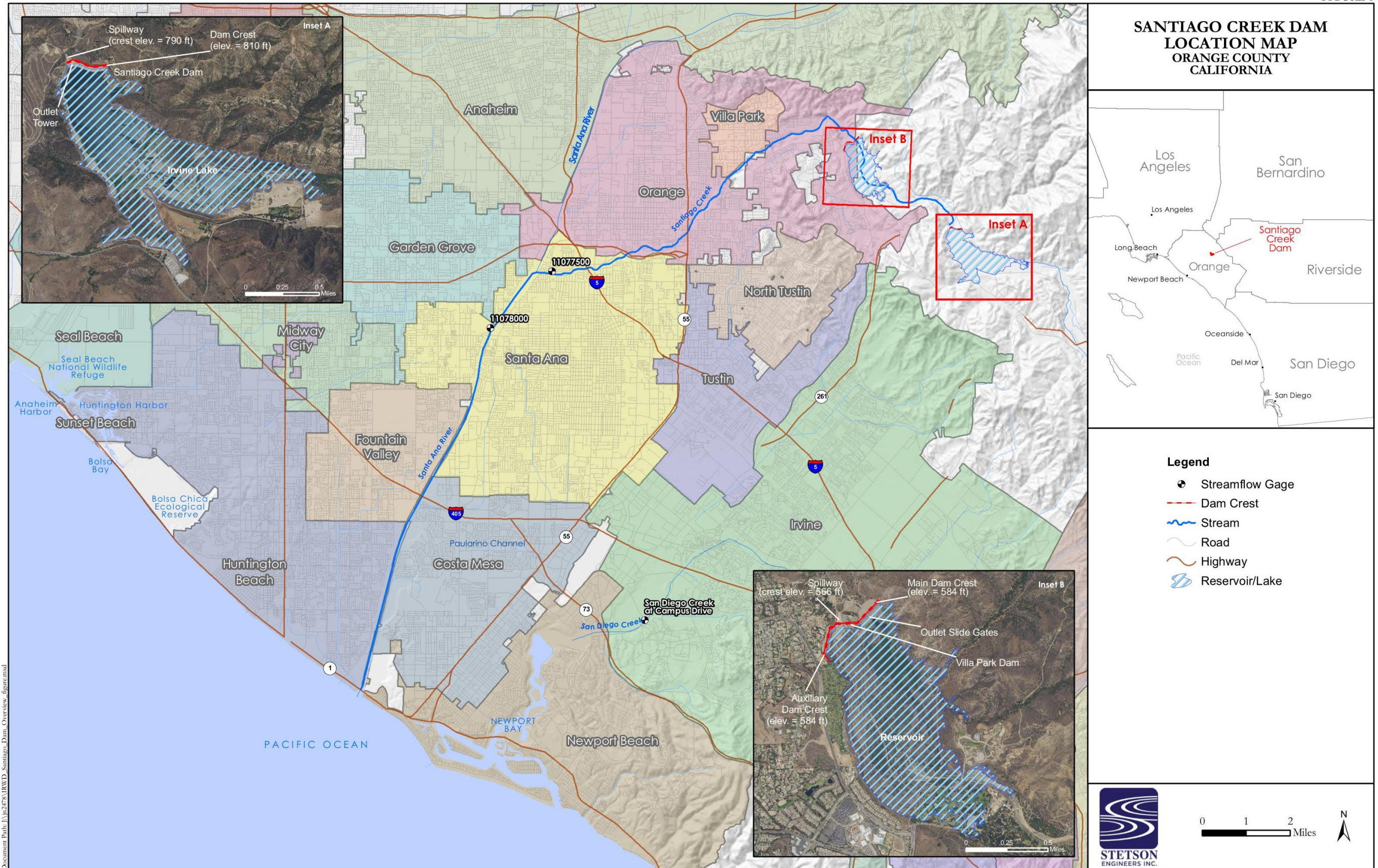


Figure 1-1 Santiago Creek Dam Reservoir Area Overview



Figure 1-2 Vicinity Map

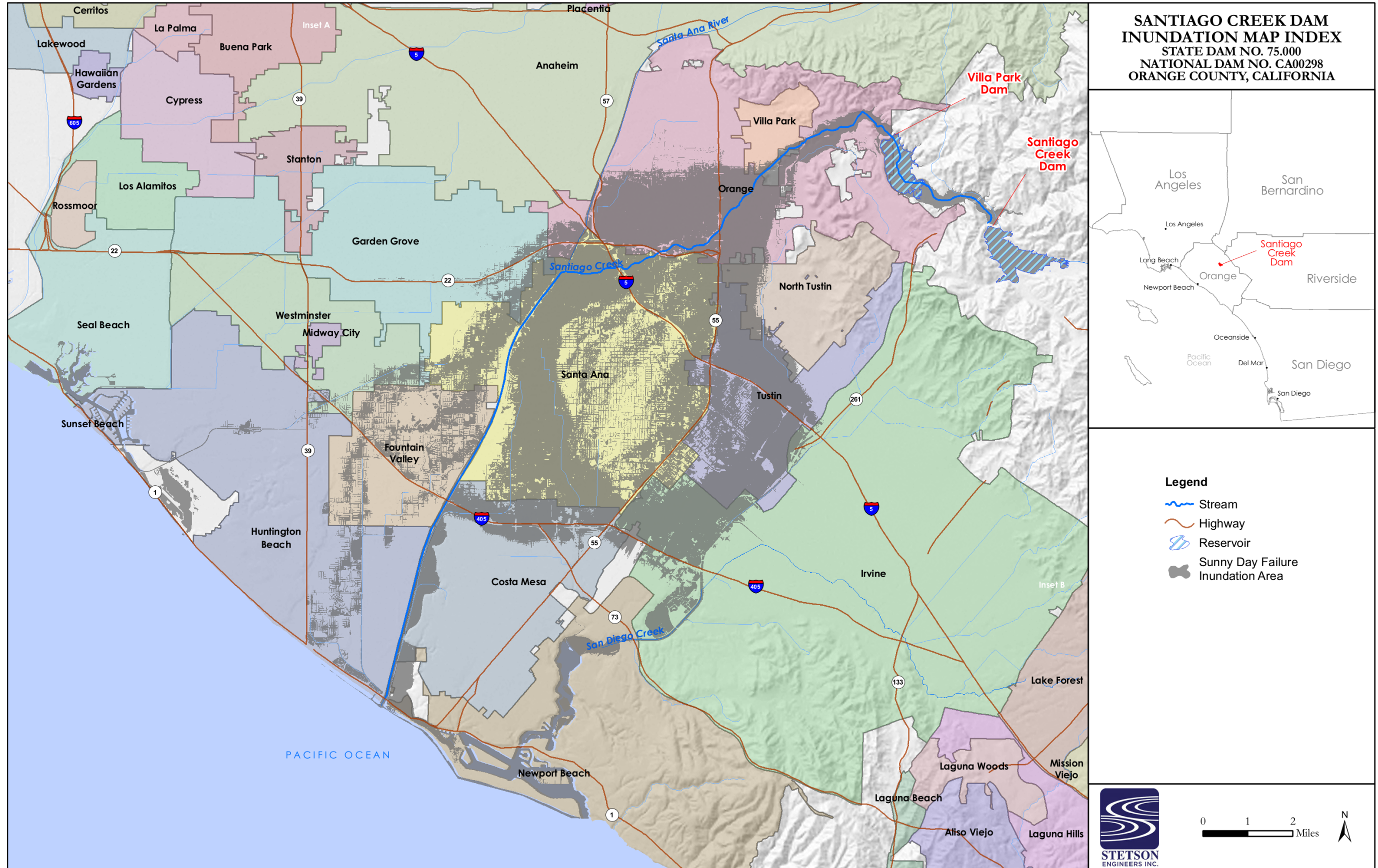


Figure 1-3 Inundation Area Overview

## 1.2 Purpose

A dam safety incident is an impending or actual sudden uncontrolled release or excessive controlled release of water from an impounding structure. The release may be caused by damage to or failure of the structure, flood conditions unrelated to failure, or any condition that may affect the safe operation of the dam. The release of water may or may not endanger human life, downstream property, or the operation of the structure. When people live in an area that could be affected by the operation or failure of a dam, there is the potential for an emergency related to a dam safety incident. The National Incident Management System (NIMS) defines an emergency as “any incident, whether natural or manmade, that requires responsive action to protect life or property.”

The purpose of this EAP is to detect actual or potential emergency situations associated with the Santiago Creek Dam, facilitate notification of affected parties, assign roles and responsibilities to involved agencies, and take mitigating actions in time to minimize loss of human life or injury and property damage. These situations include, but are not limited to dam instability, sizable earthquakes, extreme storm events, major spillway releases, overtopping of the dam, outlet system failure, abnormal instrument readings, vandalism or sabotage, spillway or gate failures, and failure of the dam.

Emergency management authorities will use the information in this EAP to facilitate the implementation of their responsibilities. Local, county, and state authorities have coordinating plans in place to address local emergency operations and/or warnings and evacuations. Those plans are not reprinted in the EAP but are maintained by the responsible agencies.

DSOD has rated the Santiago Creek Dam as “Extremely High” based on the downstream hazard classification. Because of its hazard classification, IRWD developed this EAP in accordance with the requirements listed in California Water Code Sections 6160 and 6161 and Government Code Section 8589.5, following the Federal Emergency Management Agency (FEMA) Federal Guidelines for Dam Safety: Emergency Action Planning for Dams (FEMA-64/July 2013).

## 1.3 Planning and Outreach to Affected Jurisdictions

IRWD led the preparation of the EAP on behalf of IRWD and SWD. As discussed in Section 1.1, there are thirteen jurisdictions potentially affected by a failure at Santiago Creek Dam. The jurisdictions and their emergency planning, law, and fire public safety agencies are listed in Table 1-1.

Due to the large inundation area of a failure at Santiago Creek Dam, and its location on unincorporated Orange County land, OCSD is the primary Public Safety Answering Point (PSAP) for this EAP. OCSD provides law enforcement to unincorporated areas of the inundation area. Orange County Fire Authority (OCFA)<sup>2</sup> provides fire service to unincorporated areas of Orange County, as well as several incorporated cities.

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<sup>2</sup> OCFA provides fire protection services to the following communities potentially affected in this EAP: unincorporated areas of Orange County, City of Garden Grove, City of Santa Ana, Community of North Tustin, City of Tustin, City of Westminster, City of Irvine, and City of Seal Beach.

**Table 1-1- Impacted Jurisdictions and Public Safety Agencies**

<b>Jurisdiction</b>	<b>Office of Emergency Services</b>	<b>Police Response</b>	<b>Fire Response</b>
County of Orange (un-incorporated areas) <sup>a</sup>	OCSD EMD	OCSD	OCFA
City of Orange	None <sup>b</sup>	City of Orange Police Department	City of Orange Fire Department
City of Villa Park	None <sup>c</sup>	OCSD	OCFA
City of Garden Grove	None <sup>b</sup>	Garden Grove Police Department	OCFA
City of Santa Ana	None <sup>b</sup>	Santa Ana Police Department	OCFA
City of Tustin	None <sup>b</sup>	Tustin Police Department	OCFA
City of Westminster	None <sup>b</sup>	Westminster Police Department	OCFA
City of Fountain Valley	None <sup>b</sup>	Fountain Valley Police Department	Fountain Valley Fire Department
City of Costa Mesa	None <sup>b</sup>	Costa Mesa Police Department	Costa Mesa Fire & Rescue
City of Huntington Beach	None <sup>b</sup>	Huntington Beach Police Department	Huntington Beach Fire Department <sup>d</sup>
City of Irvine	None <sup>b</sup>	Irvine Police Department	OCFA
City of Newport Beach	None <sup>b</sup>	Newport Beach Police Department	Newport Beach Fire Department
City of Seal Beach	None <sup>b</sup>	Seal Beach Police Department	OCFA

a. Includes the census-designated community of North Tustin

b. Emergency planning is coordinated through Police or Fire Department

c. City of Villa Park does not have an office of emergency services, but the City Manager requested to be included as a Plan Holder.

d. OCFA provides fire service to the Bolsa Chica area within Huntington Beach.

The EAP was sent to the following affected parties and all emergency planning, law, and fire public safety agencies for all affected jurisdictions:

- IRWD and SWD (dam owners)
- OCSD
- OCFA
- City of Orange Police Department
- City of Orange Fire Department
- City of Villa Park<sup>3</sup>
- Garden Grove Police Department
- Santa Ana Police Department
- Tustin Police Department
- Westminster Police Department
- Fountain Valley Police Department
- Fountain Valley Fire Department
- Costa Mesa Police Department
- Costa Mesa Fire and Rescue
- Huntington Beach Police Department
- Huntington Beach Fire Department
- Irvine Police Department
- Newport Beach Police Department
- Newport Beach Fire Department
- Seal Beach Police Department
- California Highway Patrol (CHP)
- CalTrans
- Transportation Corridor Agencies (Toll Roads)
- Orange County Parks
- Orange County Public Works

In May 2020, a preliminary version of the EAP was sent to all of the above parties for review. Initial comments were received from some parties, and the EAP was updated accordingly. A revised draft was circulated for a second time in October 2020. Any party that did not participate in the May 2020 review was contacted again in October 2020 and asked to review the EAP. At the end of the second review period, all jurisdictions either reviewed the EAP, or indicated that they had no comments. The feedback received from each party is summarized below:

- IRWD and SWD (dam owners) – Multiple staff provided information on staff responsibilities, dam operations, dam facilities, emergency planning, operational procedures, materials, equipment, and facilities for Santiago Creek Dam.
- OCSD – The Senior Emergency Management Program Coordinator from OCSD EMD reviewed the EAP and provided comments on plan content, phone numbers, points of

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<sup>3</sup> City of Villa Park law and fire emergency response is provided by OCSD and OCFA, respectively. Staff from the City Manager's office opted to review the EAP in addition to OCSD and OCFA staff.

contact, and notification procedures. Command Staff at OCSD North Operations reviewed the plan's contact information and content related to field operations.

- OCFA – The Division Chief for the Emergency Command Center/ Emergency Planning reviewed the plan and had no revisions. Updated contact information was provided. The Division 2, 4 and 6 Chiefs also reviewed the EAP and had no comments.
- City of Orange Police Department – Staff from the police department reviewed the plan and provided updated contact information for inclusion in the EAP.
- City of Orange Fire Department – Staff from the fire department reviewed the plan and provided updated contact information for inclusion in the EAP.
- City of Villa Park – Staff from the city reviewed the plan on behalf of the City Manager's office. City of Villa Park reviewed the document, provided comments, and provided contact information for inclusion in the EAP. IRWD responded to these comments and made adjustments to the EAP.
- Garden Grove Police Department – The EOC Operation Coordinator for the Garden Grove Police Department reviewed the plan, confirmed information about planning at the city, and provided updated contact information.
- Santa Ana Police Department – The Emergency Operations Coordinator for the City of Santa Ana Police Department reviewed the plan and provided comments. IRWD responded to these comments and made adjustments to the EAP. Updated contact information was provided for inclusion in the EAP.
- Tustin Police Department – A sergeant with the police department reviewed the EAP and clarified how emergency planning is conducted at the City of Tustin. Updated contact information was provided for inclusion in the EAP.
- Westminster Police Department – A staff member from Emergency Services at the police department reviewed the EAP, confirmed information about emergency planning, and did not have comments.
- Fountain Valley Police Department – Staff from the police department reviewed the plan and provided updated contact information for inclusion in the EAP.
- Fountain Valley Fire Department – Staff from the fire department reviewed the plan and provided updated contact information for inclusion in the EAP.
- Costa Mesa Police Department – The Emergency Services Administrator at the police department reviewed the EAP and clarified how emergency planning is conducted at the city. Updated contact information was provided for inclusion in the EAP.
- Costa Mesa Fire and Rescue – The Fire Protection Specialist/Community Education staff member reviewed the EAP and provided comments. IRWD responded to these comments and made adjustments to the EAP. Updated contact information was provided for inclusion in the EAP.
- Huntington Beach Police Department – A lieutenant from the police department reviewed the plan and provided updated contact information for inclusion in the EAP.
- Huntington Beach Fire Department – The Emergency Services Coordinator at the fire department reviewed the plan and provided updated contact information for inclusion in the EAP.
- Irvine Police Department – The Emergency Management Administrator from the police department reviewed the EAP and clarified how emergency planning is conducted at the city.

- Newport Beach Police Department – The Emergency Services Coordinator at the police department reviewed the plan and provided updated contact information for inclusion in the EAP.
- Newport Beach Fire Department – The Assistant Chief of Operations reviewed the EAP but did not have comments.
- Seal Beach Police Department – The Emergency Services Coordinator reviewed the EAP and clarified how emergency planning is conducted at the city.
- California Highway Patrol (CHP) – Staff provided updated contacts to be listed in the EAP.
- CalTrans – EAP was sent to CalTrans for review; staff provided contacts to be listed in the EAP.
- Transportation Corridor Agencies (Toll Roads) – Staff reviewed the EAP and provided contact information and notification phone numbers.
- Orange County Parks – The Operations Support Manager reviewed the EAP and confirmed the notification procedures for the parks department.
- Orange County Public Works (OCPW) – Staff reviewed the EAP and provided contact information and notification phone numbers for staff associated with Villa Park Dam.

Outreach was completed to DSOD to clarify responsibilities listed in this EAP. Additional coordination was conducted with the National Weather Service (NWS), and the Department of Water Resources (DWR) Flood Operations Center. The school districts potentially affected by an incident at Santiago Creek Dam were provided with a copy of the EAP for informational purposes.

For more information, please contact the EAP Coordinator:

Steve Choi, Director of Safety and Security



# Section 2: Summary of EAP Responsibilities

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## 2.1 Irvine Ranch Water District Responsibilities (Dam Owner)

IRWD, as the dam owner, is responsible for detecting and evaluating dam safety incidents, classifying the incident, notifying emergency management authorities, taking appropriate response actions, terminating the EAP, and follow-up tasks related to the dam incident.

General EAP responsibilities for IRWD are to:

- Detect, verify and assess emergency conditions
- Respond to emergencies at the dam site
- Activate and implement the Santiago Creek Dam EAP, including determining the appropriate emergency level.
- Notify other participating emergency management agencies of emergency conditions, emergency level, EAP activation, and other critical information
- Take corrective action at the dam/reservoir
- Terminate the EAP
- Facilitate an after-action evaluation and report
- Update EAP on at least an annual basis
- Communicate with the public and the media

More detailed responsibilities, including duties by staff member, are given in Section 6.1 and *Table 6-1 Dam Owner Responsibilities by Role*.

## 2.2 Serrano Water District Responsibilities (Dam Owner)

SWD jointly owns Santiago Creek Dam along with IRWD. While IRWD is the lead agency for notification and coordination with local public safety agencies, SWD will be notified of any potential emergency situations. SWD may be asked to assist IRWD in coordinating with the public, impacted jurisdictions, and public safety agencies.

## 2.3 Impacted Jurisdictions'/Public Safety Agencies' Responsibilities

A safety incident at Santiago Creek Dam has the potential to impact 13 jurisdictions, which are served by 18 public safety agencies, listed above in *Table 1-1- Impacted Jurisdictions and Public Safety Agencies*. The involvement of potential impacted jurisdictions is crucial to the successful implementation of the EAP. Copies of the EAP were sent to impacted jurisdictions and public safety agencies as part of a local agency coordination effort to gather feedback and input to the emergency response process laid out in this EAP (see discussion in Section 1.3). Where applicable, comments from these agencies informed the responsibilities detailed below.

### 2.3.1 Field Level Incident Management

A dam safety incident is reported through a 911 or direct phone call to OCSD (see Section 3). The emergency response through the public safety agencies will be coordinated by OCSD “Control One,” which is the central point of contact for interoperable communications between all law enforcement, fire, and public works agencies responding to a dam safety emergency at the Santiago Creek Dam. Upon notification of an incident, Control One would broadcast an emergency message to all dispatcher centers at once via radio, and would send messages via teletype over communications terminals.

Once the incident is reported, a Unified Command is expected to be established. The Unified Command would include OCSD, OCFA, representatives from IRWD and SWD (dam owners), plus representatives from all agencies of downstream jurisdictions (see Table 2-1), as necessary. The Unified Command will facilitate coordination among agencies and disciplines.

An Incident Command Post (ICP) would be established in an area near the dam, outside of the inundation zone. Possible ICP location for Santiago Creek Dam is at the parking lot for the Irvine Lake recreation area, located at 4621 E. Santiago Canyon Road, Silverado, CA 92676.

The County and OA EOC is expected to be activated during emergencies at Santiago Creek Dam. The EOC would be established at the County Emergency Management office at 2644 E Santiago Canyon Rd, Silverado, California.

The Unified Command will facilitate coordination among agencies and disciplines. Responsibilities consist of establishing the ICP, protecting life and property, controlling personnel and equipment resources, maintaining accountability for responder and public safety, and establishing and maintaining an effective liaison with outside agencies and organizations. The Unified Command is responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources.

Unified Command duties may include the following:

- Establishing command.
- Ensuring responder safety.
- Assessing incident priorities.
- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Proclamation of a Local Emergency by local authorities.
- Determining operational objectives.
- Developing an appropriate organizational structure.
- Maintaining a manageable span of control.
- Coordinating overall emergency activities.
- Establish evacuation routes and road closures
- Care and shelter operations, including establishing shelters.
- Facilitating return of evacuated individuals.

- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.
- Coordinating the activities of outside agencies.
- Authorizing the release of information to the media.
- Terminating the emergency response<sup>4</sup>.
- Coroner operations.
- Participating in an annual review and update of the EAP.
- Participating in an after-action evaluation.

### **2.3.2 Orange County Sheriff's Department, Emergency Management Division**

Thirty-four incorporated cities in the county are responsible for emergency planning within their jurisdictions. The County is responsible for the emergency planning of 205 square miles of unincorporated area and all county-owned facilities and properties.

Based on the inundation mapping conducted in support of this EAP, activation of the County and OA EOC is anticipated for any failure scenario at Santiago Creek Dam. The dam is located on unincorporated County land, which is under the jurisdiction of OCSD. Moreover, an emergency at the Santiago Creek Dam would most likely impact multiple cities and communities, so it is necessary to have a response coordinated at the County level.

OCSD would be responsible for coordinating evacuations in unincorporated areas of the inundation area, including unincorporated county land near the Santiago Creek Dam including Irvine Regional Park, the community of North Tustin, Bolsa Chica State Beach, and some unincorporated areas between Costa Mesa and Newport Beach.

The County of Orange and Operational Area Emergency Operations Plan (County and OA EOP) provides guidance and procedures for the County to prepare for and respond to significant or catastrophic natural, technological or conflict-related incidents that produce situations requiring a coordinated response. The OCSD EMD is responsible for developing, maintaining and distributing the County and OA EOP.

There are two roles within the OA discussed in this EAP: County and OA EOC Manager and the Operational Area Coordinator (OAC).

County and OA EOC Manager. The OCSD EMD Director serves as the County and OA EOC Manager. The County and OA EOC Manager is the 24-hour point of contact for the County, OA, State, Federal entities and agencies, and Mutual Aid Coordinators.

Responsibilities of the County and OA EOC Manager may include:

- Establish and maintain contact with the affected dam and reservoir owner or operators.
- Request current situational status of the affected dam and reservoir.

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<sup>4</sup> The Unified Command has the authority to terminate the emergency response. IRWD, as the dam owner, will terminate the EAP.

- Ensure the OAC, Board of Supervisors and Policy Group are notified and kept apprised of emergency conditions occurring due to a dam and reservoir failure event.
- Coordinate with the OAC to establish activation level of the County and OA EOC.
- Direct EMD staff to notify appropriate key personnel to report to the County and OA EOC, based on the activation level established.
- Establish and maintain communication with all impacted jurisdictions to ensure coordination of response activities and situational information.
- Ensure situational information is provided to OA jurisdictions, County departments and Cal OES, and updated on a regular basis.
- Assist with the coordination of the County's reentry and recovery efforts.

Operational Area Coordinator. When an emergency impacts an OA jurisdiction, the Orange County Operational Area Agreement designates the OAC as being responsible for direction, coordination and communication of policy decisions, and coordinating resource needs and priorities between OA jurisdictions and the State throughout the emergency. In cases of dam and reservoir failure, the County and OA Emergency Operational Plan, Dam and Reservoir Failure Annex designates OCPW as the OAC.

Responsibilities of the OAC may include:

- Serve as a key decision maker in the County and OA EOC, providing direction and coordination necessary to accomplish the purposes of the Operational Area Agreement and responsibilities of the Operational Area Lead as specified in Title 19 California Code of Regulations Section 2409 (e).
- Coordinate with OA jurisdictions during emergency response.
- Maintain contact with the dam and reservoir owner/operator to receive regular updates on water releases and situation status.
- Represent the OA in all dealings with the public or private agencies on matters pertaining to emergencies.
- Appoint a Public Information Manager (PIM) to coordinate dissemination of all emergency information.
- In coordination with the PIM, prepare and approve dam and reservoir failure information statement and instructions for the public to be released via: media, Emergency Alert Systems, NWS, and AlertOC.
- Activate the County and OA EOC to the appropriate level of organization and staffing to support operations.
- Participate in conference calls.
- Initiate discussion with the Policy Group on the necessity to proclaim a Local Emergency and/or Operational Area Proclamation of Emergency.

A dam and reservoir failure may require multi-jurisdiction, multi-agency and multi-discipline coordination at all levels, including first responders. The appropriate Standardized Emergency Management System (SEMS) and NIMS functions will be activated, based on the failure threat or situation. Activation of the County and OA EOC is required by SEMS, Title 19 California Code of Regulations Section 2409 (f), under the following conditions:

- On Request - A local government within the OA has activated its EOC and requested activation of the County and OA EOC to support its emergency operations. Jurisdiction(s) determine that additional response resources beyond that which would normally be covered by mutual aid are required and assistance from the OA may be necessary.
- Two City Local Emergency - Two or more cities within the OA have proclaimed a Local Emergency.
- County and City Local Emergency - The County and one or more cities have proclaimed a Local Emergency.
- Request for Governor's Proclamation - A city, city and County, or County has requested a Governor's proclamation of a State of Emergency, as defined in Government Code 8558(b).
- State of Emergency - A State of Emergency is proclaimed by the Governor of the State for the County or two or more cities within the OA.
- Request for Outside Resources - The OA is requesting resources from outside its boundaries, except those resources used in normal day-to-day operations which are obtained through existing agreements providing for the exchange or furnishing of certain types of facilities and services on a reimbursable, exchange, or other basis as provided for under the Master Mutual Aid Agreement.

### **2.3.3 City of Orange (Orange Police Department and Orange Fire Department)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate a large area of the City of Orange at a depth of greater than one foot, meaning that evacuation of many residents may be necessary. Emergency planning for the City of Orange is coordinated through the Orange Fire Department. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuation in the City of Orange would be carried out by the City of Orange Police Department and City of Orange Fire Department. Actions taken by the Orange Police and Fire Departments in the event of a failure at Santiago Creek Dam may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.4 City of Villa Park (OCSD and OCFA)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate portions of the City of Villa Park at a depth of greater than one foot, meaning that evacuation of some residents may be necessary. Emergency planning for the City of Villa Park is coordinated through OCSD, which provides police services to City of Villa Park. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Villa Park would be carried out by OCSD and OCFA, which provides fire response for the City of Villa Park. Actions taken by the City of Villa Park in the event of a failure at Santiago Creek Dam may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.5 City of Garden Grove (Garden Grove Police Department and OCFA)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate portions of the City of Garden Grove at a depth of greater than one foot, meaning that evacuation of some residents may be necessary. Emergency planning for the City of Garden Grove is coordinated through the Garden Grove Police Department. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Garden Grove would be carried out by the Garden Grove Police Department and OCFA. City of Garden Grove responsibilities include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.

- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.6 City of Santa Ana (Santa Ana Police Department and OCFA)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate a large area within the City of Santa Ana at a depth of greater than one foot, meaning that evacuation of many residents may be necessary. Emergency planning for the City of Santa Ana is coordinated through the Emergency Management department of the Santa Ana Police Department. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Santa Ana would be carried out by the Santa Ana Police Department and OCFA. Santa Ana Police Department and OCFA responsibilities include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.7 City of Tustin (Tustin Police Department and OCFA)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate a large area of the City of Tustin at a depth of greater than one foot, meaning that evacuation of many residents may be necessary. Emergency planning for the City of Tustin is coordinated through the Tustin Police Department. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Tustin would be carried out by the Tustin Police Department and OCFA. Tustin Police Department and OCFA responsibilities include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.

- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.8 City of Westminster (Westminster Police Department and OCFA)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate portions of the City of Westminster at a depth of greater than one foot, meaning that evacuation of some residents may be necessary. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Westminster would be carried out by the Westminster Police Department and OCFA. Actions taken by the City of Westminster in the event of a failure at Santiago Creek Dam may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.9 City of Fountain Valley (Fountain Valley Police Department and Fountain Valley Fire Department)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate portions of the City of Fountain Valley at a depth of greater than one foot, meaning that evacuation of some residents may be necessary. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Fountain Valley would be carried out by the Fountain Valley Police and Fire Departments. Actions taken by the City of Fountain Valley in the event of a failure at Santiago Creek Dam may include:



- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Establish evacuation routes and road closures.
- Evacuation and rescue operations.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.10 City of Costa Mesa (Costa Mesa Police Department and Costa Mesa Fire and Rescue)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate portions of the City of Costa Mesa at a depth of greater than one foot, meaning that evacuation of some residents may be necessary. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Costa Mesa would be carried out by the Costa Mesa Police Department and Costa Mesa Fire and Rescue. Actions taken by the City of Costa Mesa in the event of a failure at Santiago Creek Dam may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

In the event of a failure at Santiago Creek Dam, inundation in the City of Costa Mesa would occur in the western and northern areas of the city. Areas potentially inundated include: lands adjacent to the Santa Ana River, including Mesa Verde Country Club, Fairview Park and Talbert Regional Park; and residential and commercial areas near Interstate 405 at and near the

intersections of Harbor Blvd, Fairview Rd, State Route 73, and Bristol St. Detailed inundation areas for the City of Costa Mesa are shown in Part II on map panels K9 through K12, L8 through L12, M8, M9, N8, and O8.

### **2.3.11 City of Irvine (Irvine Police Department and OCFA)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate portions of the City of Irvine at a depth of greater than one foot, meaning that evacuation of some residents may be necessary. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Irvine would be carried out by the Irvine Police Department and OCFA. Actions taken by the City of Irvine in the event of a failure at Santiago Creek Dam may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.12 City of Newport Beach (Newport Beach Police Department and Newport Beach Fire Department)**

In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Within City of Newport Beach limits, a sudden and total failure of Santiago Creek Dam would most likely be confined to Newport Bay within the San Diego Creek watershed. In those areas, evacuation of residents is not likely to be necessary. At the mouth of the Santa Ana River near the West Newport neighborhood off of Highway 1, inundation at depth greater than one foot is possible and evacuations may be necessary there. Actions taken by the City of Newport Beach in the event of a failure at Santiago Creek Dam may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.

- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.13 City of Huntington Beach (Huntington Beach Police Department and Huntington Beach Fire Department)**

A sudden and total failure of Santiago Creek Dam has the potential to inundate portions of the City of Huntington Beach at a depth of greater than one foot, meaning that evacuation of some residents may be necessary. In the event of an incident at Santiago Creek Dam, field level response will be coordinated with the Unified Command. Evacuations in the City of Huntington Beach would be carried out by the Huntington Beach Police and Fire Departments. Actions taken by the City of Huntington Beach in the event of a failure at Santiago Creek Dam may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.
- Identifying the need for mutual aid and requesting such through the Orange County OA.
- Proclamation of a Local Emergency by local authorities.
- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Medical care operations.
- Care and shelter operations.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.14 City of Seal Beach (Seal Beach Police Department and OCFA)**

Within City of Seal Beach limits, a sudden and total failure of Santiago Creek Dam would most likely be confined to existing waterways, meaning that evacuation of residents is not likely to be necessary. In the event of an incident at Santiago Creek Dam, any field level response will be coordinated with the Unified Command. Actions would be carried out by the Seal Beach Police Department and OCFA, which provides fire service to Seal Beach. Responsibilities may include:

- Advising threatened populations of the emergency, and apprising them of safety measures to be implemented.

- Dissemination of accurate and timely emergency public information and warning to the public.
- Evacuation and rescue operations.
- Establish evacuation routes and road closures.
- Facilitate return of evacuated individuals.
- Access and perimeter control.
- Public health operations.
- Restoration of vital services and utilities.

### **2.3.15 California Governor’s Office of Emergency Services and Cal OES Warning Center**

Cal OES plays dual roles in managing an emergency; one at the regional level and the other at the state level. The regions include Inland Region, Coastal Region, and Southern Region, while the state level constitutes the executives and brokers resources between the regions. The state level also interfaces with the National Response Framework, and informs the governor, legislature, and state emergency management stakeholders. Cal OES also implements state-level media policy and provides the primary coordination with SEMS and NIMS at the federal level. Cal OES Southern Region will participate in the reviews of and updates to the EAP.

The Dam Safety Planning Division is responsible for reviewing and approving dam owners’ EAP. This process includes division outreach and technical assistance to dam owners and local emergency management personnel. The Cal OES Dam Safety Planning Division may also provide guidance to local public safety agencies with regard to incorporating EAPs into their existing all-hazards key response and mitigation plans. The division will also participate in the annual review and update of the EAP.

The Cal OES Warning Center is the link for notifications between state and federal agencies for this EAP. At the request of the OA manager or a state agency, the Warning Center can obtain rapid responses from the personnel who coordinate resources for emergency response. The Warning Center is operated 24 hours a day, 7 days a week.

### **2.3.16 California Department of Water Resources – Division of Safety of Dams**

The mission of DSOD is to protect people against the loss of life and property due to dam failure. The California Water Code entrusts this regulatory power to DWR, which delegates the responsibility to DSOD. Section 6110 of the Water Code directs the Department to immediately employ any remedial means necessary to protect life and property if either: (a) the condition of the dam is so dangerous to the safety of life or property as to not permit time for the issuance and enforcement of an order relative to maintenance or operation, or (b) passing or imminent floods threaten the safety of any dam or reservoir. Section 6111 of the Water Code states that in applying the remedial means “the department may, in emergency, do any of the following: (a) lower the reservoir; (b) completely empty the reservoir; (c) take such other steps as may be essential to safeguard life and property.” In the event of an emergency at the dam, DSOD actions could include, but are not limited to:

- Advising the dam owner’s/operator’s representative of remedial actions to take.

- Ordering the dam owner's/operator's representative of remedial actions to take.
- Assuming control of the dam if necessary to safeguard life and property.
- Advising the dam owner's/operator's representative of the emergency level determination.
- Inspecting the dam during and after the emergency.
- Design review and approval of emergency repairs.
- Acting as a dam technical specialist in the State Operations Center, or other emergency operations center.

Additionally, per Water Code Sections 6160 and 6161, DSOD is responsible for the review and approval of inundation maps. The California Code of Regulations, Title 23, Division 2, Chapter 1, Article 6 defines the specific requirements of the inundation maps.

IRWD communicated with DSOD staff to confirm DSOD responsibilities as described in this EAP. These DSOD responsibilities were provided to IRWD by Richard Draeger, the regional engineer, via email on December 12, 2019.

### **2.3.17 National Weather Service Weather Forecast Office**

The NWS has a congressional mandate to issue official public warnings for all weather-related events, including dam breaches and flooding. The NWS communicates all flash flood watches and warnings based on the inundation maps provided in this EAP. The San Diego Weather Forecast Office has a copy of the enclosed inundation map and will issue official public warnings upon notification, as appropriate, and in coordination with IRWD, SWD, and the Unified Command for an incident at Santiago Creek Dam. The NWS WFO will issue a 'Flash Flood Watch' for a potential dam failure and a 'Flash Flood Warning' following the confirmation of a dam failure for downstream areas.

### **2.3.18 DWR Flood Operations Center**

The mission of the DWR Division of Flood Management is to prevent loss of life and reduce property damage caused by floods and to assist in recovery efforts following any natural disaster. The State-Federal Flood Operations Center, located in Sacramento, California, is operated by the Division of Flood Management. The Flood Operations Center provides a facility from which DWR can centrally coordinate emergency response state-wide. Upon activation of this EAP, the DWR Flood Operations Center will be notified by the dam owner. During a potential or imminent failure scenario, the DWR Flood Operations Center would be responsible for assisting with coordination among state and local agencies. The DWR Flood Operations Center can also provide technical assistance during an incident.

### **2.3.19 California Highway Patrol**

A copy of the EAP was sent to California Highway Patrol (CHP). State routes and highways downstream of Santiago Creek Dam would be impacted by a breach at the dam. CHP dispatch is included in the notification charts in this EAP. In the event of an emergency at Santiago Creek

Dam, CHP would be responsible for evacuating impacted state highways and controlling traffic on these roads. CHP response would be coordinated by the Unified Command/IC.

### **2.3.20 CalTrans**

A copy of the EAP was sent to CalTrans staff at the District 12 (Orange County) office so that they could review the EAP with regard to state highway facilities. Emergency response at state highways would be coordinated by CHP through the Unified Command, but CalTrans staff may assist with response related to state-managed road facilities.

### **2.3.21 Transportation Corridor Agencies (Orange County Toll Roads)**

A copy of the EAP was sent to Transportation Corridor Agencies (TCA), who administers the Toll Roads of Orange County. The Toll Roads of 261 and a small area of 73 could be affected by inundation from Santiago Creek Dam. The EAP was provided for their planning purposes. Caltrans owns the Toll Roads and maintains them as part of the state highway system and the California Highway Patrol is responsible for law enforcement on the Toll Roads.

### **2.3.22 Orange County Public Works**

A copy of the EAP was sent to Orange County Public Works (OCPW), as channel facilities and infrastructure managed by OCPW may be affected by an incident at Santiago Creek Dam. OCPW is a plan holder of this EAP and may assist with response related to county-managed facilities. OCPW operates Villa Park Dam, which is downstream of Santiago Creek Dam and could be affected by a breach at Santiago Creek Dam. In the event of an incident at Santiago Creek Dam, IRWD staff will notify OCPW staff so that they can take appropriate action at Villa Park Dam in response to the upstream emergency.

### **2.3.23 School Districts**

The EAP was sent to school districts potentially affected by an incident at Santiago Creek Dam. The school districts do not have formal responsibilities in this EAP. The plan was provided to them for their information and planning.

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## Section 3: Notification Flowcharts

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### 3.1 Notification Flowcharts

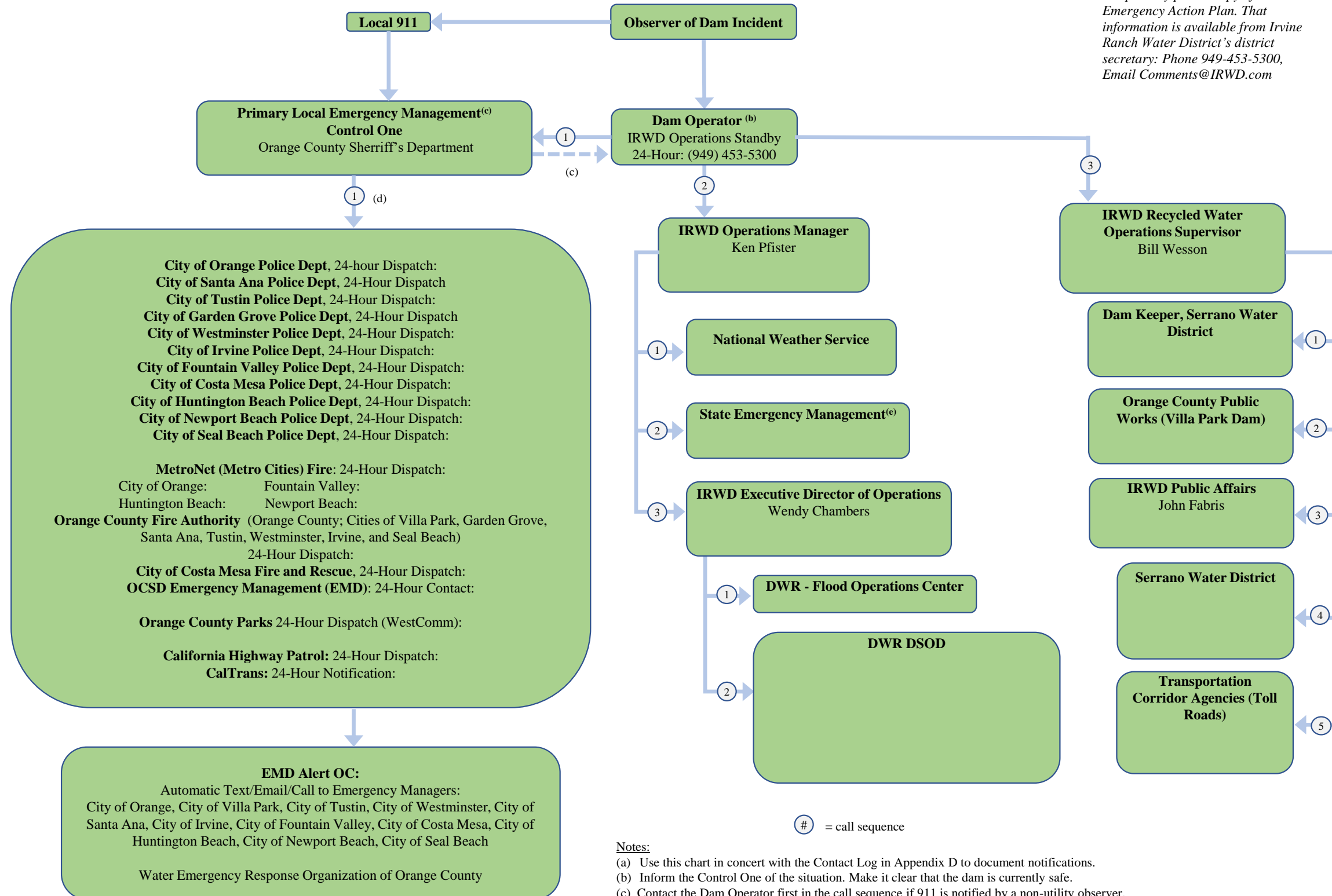
This section contains notification flowcharts and accompanying messages for each emergency level that could be activated at the Santiago Creek Dam: high flow, non-failure, potential failure, and imminent failure. The high flow and non-failure scenarios share a notification flow chart, as the same parties would be notified during each event, but have different notification messages. The notification messages for all emergency levels can also be found in Appendix E of this EAP.

In the event of an emergency situation, IRWD and public safety agencies should reference these flowcharts to know who to contact and in what order. Individuals or organizations at the beginning of flowchart branches are responsible for making all calls within that branch, in the order indicated. If a party is not answering the number indicated on the flowchart, the notifying party should reference the contact table given in Section 3.2 for alternate methods of contact. In order to facilitate clear and efficient communication of emergency conditions, suggested scripts for notification are included after each flowchart.

The potential failure and imminent failure notification flowcharts require that OCSD make additional calls as part of the notification process. IRWD has coordinated with OCSD EMD to ensure that they have a copy of the EAP on hand and will utilize the notification flowcharts in Section 3.1. The department has agreed to perform the responsibilities in the notification flowcharts and in this EAP. These instructions will be updated annually when the plan is reviewed and contacts are updated (see Section 8.1).

**High Flow or Non-Failure Notification Flowchart<sup>(a)</sup>**

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com



- Notes:**
- (a) Use this chart in concert with the Contact Log in Appendix D to document notifications.
  - (b) Inform the Control One of the situation. Make it clear that the dam is currently safe.
  - (c) Contact the Dam Operator first in the call sequence if 911 is notified by a non-utility observer.
  - (d) Control One to broadcast to all dispatcher centers at once via radio and send messages via teletype over communications terminals.
  - (e) Contact Cal OES if deemed necessary by Operations Manager. Use the Cal OES Warning Center Dam Incident Report in Appendix I. Copy to Orange County Sheriff's Department.



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## High Flow Emergency Level Notification Script

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County.

We have activated the Emergency Action Plan for this dam and are determining this to be a **High Flow** condition. The Santiago Creek Dam is not in danger of failing. Again, this is a **High Flow** condition and the Santiago Creek Dam is not in danger of failing.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that flows into the reservoir  
(time) (date)  
are unusually high.

Current flow into the reservoir is \_\_\_\_ cfs.

Current flow out of the reservoir is \_\_\_\_ cfs.

Current water surface elevation in the reservoir is \_\_\_\_ feet.

The dam is not predicted to fail as a result of this condition. We will provide updates detailing any changes in flow or dam condition, and will notify you when the high flow situation is resolved.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

**Non-Failure Emergency Level**

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Non-Failure** condition. Again, this is a **Non-Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to investigate and respond to this condition.

The dam is not predicted to fail as a result of this condition.

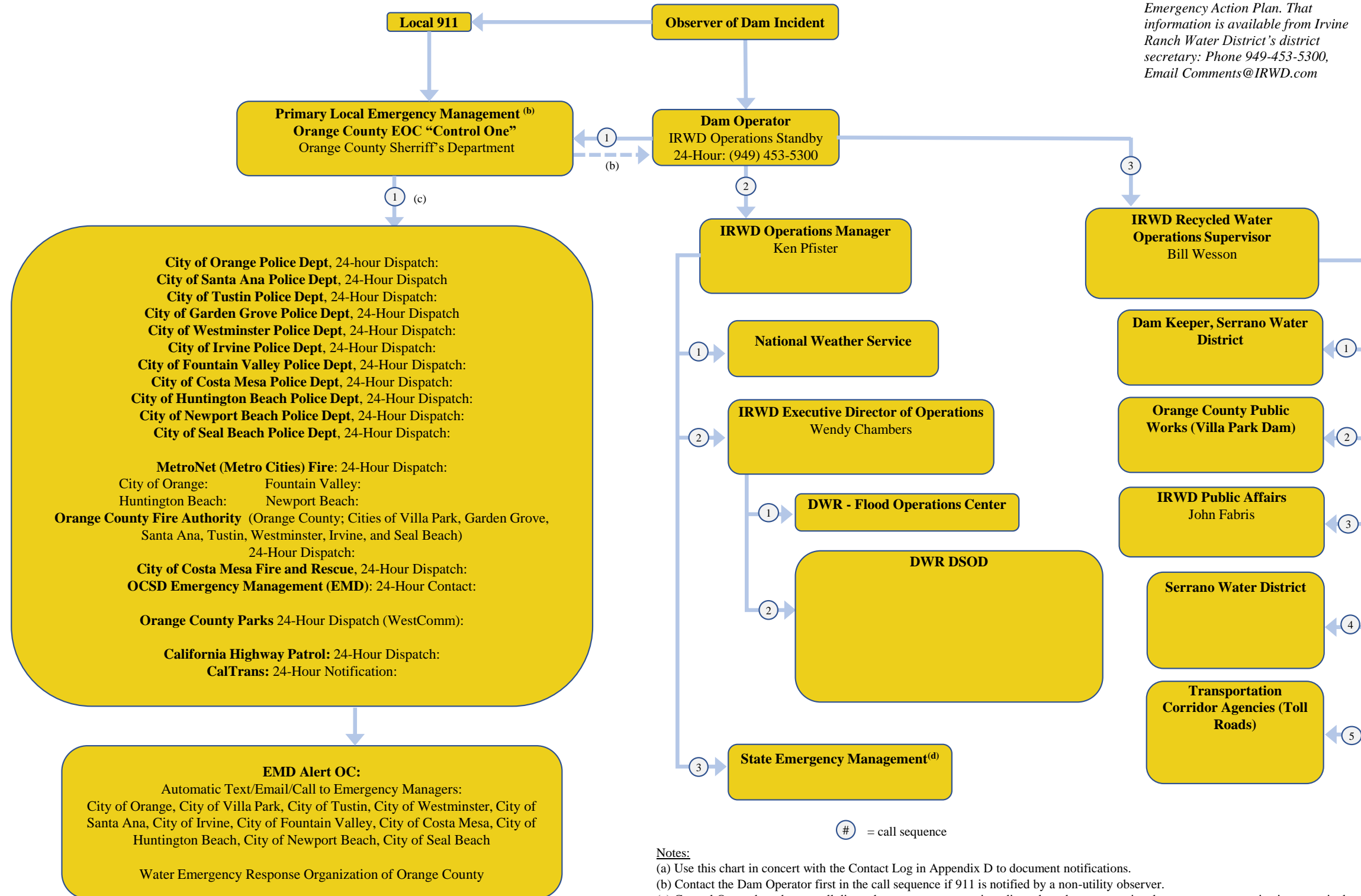
We will advise you when the situation is resolved or if the situation gets worse.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

**Potential Failure Notification Flowchart<sup>(a)</sup>**

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com



# = call sequence

**Notes:**

- (a) Use this chart in concert with the Contact Log in Appendix D to document notifications.
- (b) Contact the Dam Operator first in the call sequence if 911 is notified by a non-utility observer.
- (c) Control One to broadcast to all dispatcher centers at once via radio and send messages via teletype over communications terminals.
- (d) Use the Cal OES Warning Center Dam Incident Report in Appendix I. Copy to Orange County Sheriff's Department.

---

## Potential Failure Emergency Level

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Potential Failure** condition.

We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure.

Please reference the inundation maps and prepare to evacuate the low-lying portions of south Orange, Santa Ana, Tustin, Fountain Valley, and north Costa Mesa. In the event of a failure, portions of I-5, I-405, CA-22, CA-55, and CA-57 are expected to be inundated along with many surface streets throughout the area.

The dam could potentially fail as early as \_\_\_\_\_.

Reference the inundation map in your copy of the Emergency Action Plan.

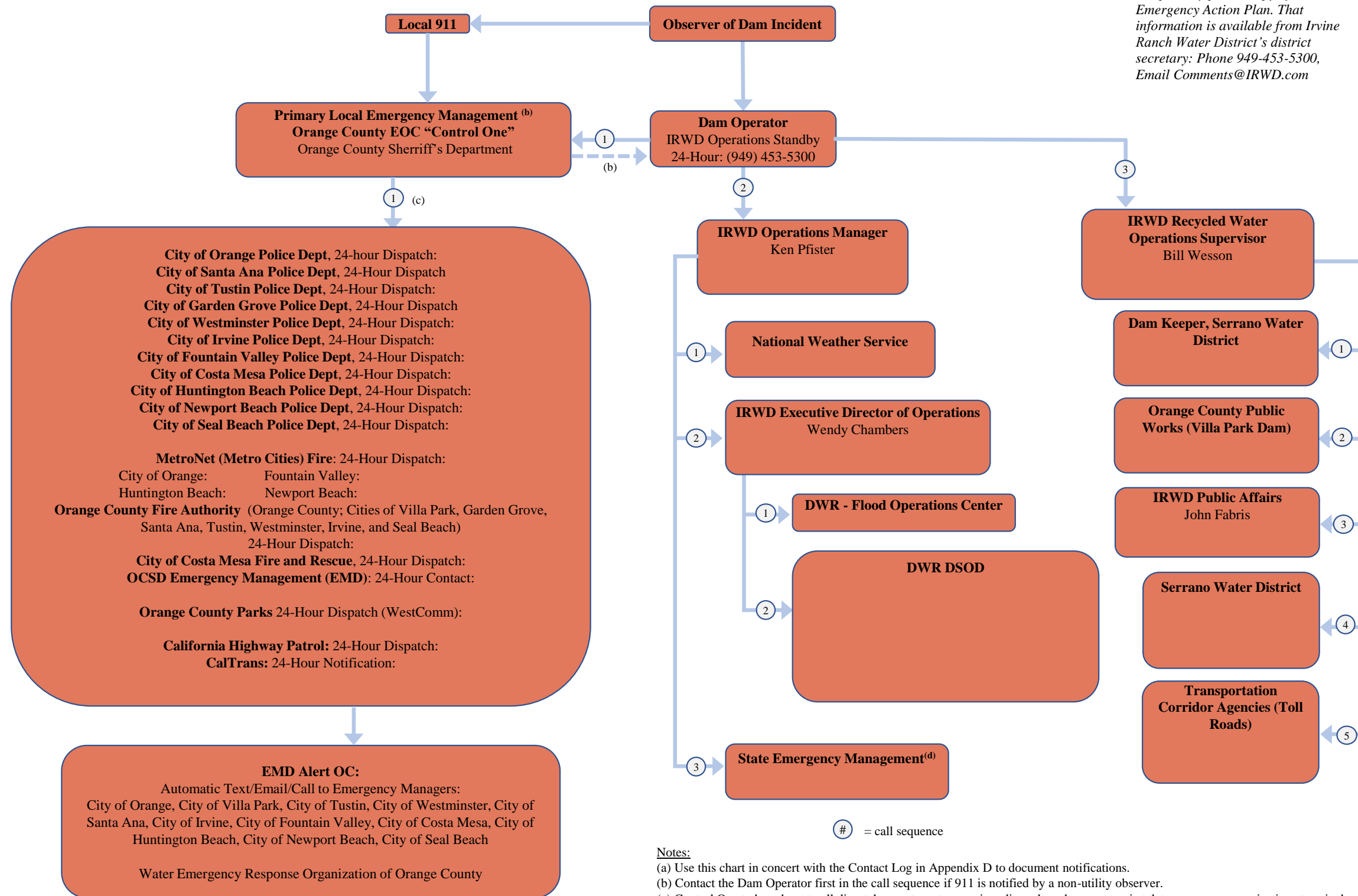
We will advise you when the situation is resolved or if the situation gets worse.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

**Imminent Failure Notification Flowchart<sup>(a)</sup>**

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com



# = call sequence

**Notes:**

- (a) Use this chart in concert with the Contact Log in Appendix D to document notifications.
- (b) Contact the Dam Operator first in the call sequence if 911 is notified by a non-utility observer.
- (c) Control One to broadcast to all dispatcher centers at once via radio and send messages via teletype over communications terminals.
- (d) Use the Cal OES Warning Center Dam Incident Report in Appendix I. Copy to Orange County Sheriff's Department.

---

### **Imminent Failure Emergency Level**

This is an emergency. This is \_\_\_\_\_ [your name and position].

Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County, is failing.

The downstream area must be evacuated immediately.

Repeat, Santiago Creek Dam is failing; evacuate the low-lying portions of south Orange, Santa Ana, Tustin, Fountain Valley, and north Costa Mesa. Portions of I-5, I-405, CA-22, CA-55, and CA-57 are expected to be inundated along with many surface streets throughout the area.

We have activated the Emergency Action Plan for this dam and are determining this to be an Imminent Failure condition.

Reference the inundation map in your copy of the Emergency Action Plan.

I can be contacted at the following number \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

The next status report will be provided in approximately 30 minutes.

## Public Message

The following pre-scripted message may be **used for emergency management authorities to communicate the Imminent Failure of the dam with the public:**

Attention: This is an emergency message from \_\_\_\_\_ [emergency management agency]. Listen carefully. Your life may depend on immediate action.

Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County, is failing.  
Repeat. Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County, is failing.

If you are in or near this area, proceed immediately to high ground. The low-lying portions of south Orange, Santa Ana, Tustin, Fountain Valley, and north Costa Mesa may be flooded. Portions of I-5, I-405, CA-22, CA-55, and CA-57 are expected to be inundated along with many surface streets throughout the area, and access may be limited. High flows are expected in Santiago Creek, Santa Ana River, San Diego Creek, and Upper Newport Bay. Do not approach channels where high flow is expected.

If you are in or near this area, proceed immediately to high ground away from low lying areas.

Repeat message.

### 3.2 Contact Information Table

The contact table below lists all parties included in the notification flowcharts, along with other key stakeholders. If unable to contact a party using the method shown on the flowcharts, refer to this table to attempt to contact through a different pathway. All contacts included in the flow charts and contact tables are confirmed to be up-to-date as part of the annual EAP review process.

Organization	Name (Title)	Primary Phone #	Secondary Phone #	Email Address
Cal OES	California State Warning Center			
Caltrans (District 12)	24-hour Notification Number			
Caltrans (District 12)	Bala Nanjappa, (D-12 Maintenance Engineering)			
CHP	24-Hour Dispatch in Santa Ana			
CHP	State Dispatch number			
CHP	Sergeant Jeff Beam			
CHP	Lt. Bradley Palmer			
CHP	Captain Michael Harris			
Costa Mesa Fire and Rescue	Dan Stefano (Fire Chief)			
Costa Mesa Fire and Rescue	24-hour Dispatch			
Costa Mesa Police Department	Jason Dempsey (Emergency Services Administrator)			
Costa Mesa Police Department	24-hour Dispatch <sup>5</sup>			
Costa Mesa Police Department	Watch Commander			
Costa Mesa Police Department	Non-Emergency Dispatch			
DWR DSOD	Andrew Mangney (Chief, Field Engineering Branch)			

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300. Email Comments@IRWD.com

<sup>5</sup> Costa Mesa Police and Fire and Rescue are co-located and dispatch number reaches both departments.



Organization	Name (Title)	Primary Phone #	Secondary Phone #	Email Address
DWR DSOD	Richard Draeger (Southern Regional Engineer)			
DWR DSOD	Cameron Lancaster (Field Engineering Branch – Area 9)			
Fountain Valley Fire Department	Ron Cookston (Fire Chief)			
Fountain Valley Fire Department	Metro Net Dispatch (24-hour)			
Fountain Valley Police Department	Matt Sheppard (Chief of Police)			
Fountain Valley Police Department	Watch Commander (24-hour)			
Fountain Valley Police Department	Emergency Dispatch			
Garden Grove Police Department	Tom DeRe (Chief)			
Garden Grove Police Department	Linda Morin (EOC Operation Coordinator)			
Garden Grove Police Department	Emergency Dispatch			
Garden Grove Police Department	Non-Emergency Dispatch			
Huntington Beach Fire Department	Scott Haberle (Fire Chief)			
Huntington Beach Emergency Mgnt.	Brevyn Mettler Emergency Svc. Coordinator			
Huntington Beach Fire Department	Metro Net 24-hour Dispatch			
Huntington Beach Police Department	Eric Parra, Chief of Police			
Huntington Beach Police Department	Non-Emergency Dispatch			
Irvine Police Department	Robert Simmons (Emergency Management Administrator)			

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

Organization	Name (Title)	Primary Phone #	Secondary Phone #	Email Address
Irvine Police Department	Non-Emergency Dispatch			
IRWD	Paul Cook, P.E. (General Manager)			
IRWD	Ken Pfister (Water Operations Manager)			
IRWD	Wendy Chambers (Executive Director of Operations)			
IRWD	Bill Wesson (Recycled Water Operations Supervisor)			
IRWD	John Fabris (Public Affairs)			
IRWD	Steve Choi (Director of Safety and Security)			
IRWD	Operations Standby			
Newport Beach Police Department	Jon T. Lewis (Chief of Police)			
Newport Beach Police Department	Katie Eing (Emergency Services Coordinator)			
Newport Beach Utilities Department	Casey Parks (Water Production Supervisor)			
Newport Beach Fire Department	Jeff Boyles (Fire Chief)			
NWS	National Weather Service			
OCFA	Phillip Johnson (Division Chief, ECC/Emergency Planning)			
OCFA	Shane Sherwood (Division 2 Chief)			
OCFA	Baryic Hunter (Division 4 Chief)			
OCFA	James Henery (Division 6 Chief)			
OCFA	Non-Emergency Dispatch			
OCSD	Emergency Operations Center "Control One"			

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-3300, Email Comments@IRWD.com

Organization	Name (Title)	Primary Phone #	Secondary Phone #	Email Address
OCSD	Non-Emergency Dispatch			
OCSD	Michelle Anderson (Emergency Management Director)			
OCSD	Brent Benson (Commander-North Operations)			
OCSD	Gary Knutson (Captain- North Ops/Villa Park)			
OCSD	Derek Gard, (Supervising Communications Coordinator)			
OCSD	Kevin McArthur (Senior Emergency Management Program Coordinator)			
Orange County Parks	Dispatch (WestComm)			
Orange County Parks	Zachary Salazar (Operations Support Manager)			
OCPW	Penny Lew, P. E. (Senior Civil Engineer)			
OCPW	Leonel Estrada			
OCPW	Trevor Richardson Emergency Management Administrator			
Orange Police Department	Dan Adams (Chief of Police)			
Orange Police Department	Adam Jevic (Captain)			
Orange Police Department	Jennifer Amat (Lieutenant)			
Orange Police Department	Clara Valdez (Sergeant)			
Orange Fire Department	Sean deMetropolis (Fire Chief)			
Orange Fire Department	Non-Emergency Dispatch			
Orange Fire Department	Metro Net 24-hour Dispatch			
Santa Ana Police Department	David Valentin (Chief of Police)			

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Organization	Name (Title)	Primary Phone #	Secondary Phone #	Email Address
Santa Ana Police Department	Steve Rhyner, Emergency Operations Coordinator			
Santa Ana Police Department	Emergency Dispatch			
Santa Ana Police Department	Non-Emergency Dispatch			
Seal Beach Police Department	Philip L. Gonshak (Police Chief)			
Seal Beach Police Department	Brian Gray (Emergency Services Coordinator)			
Seal Beach Police Department	West-Comm Dispatch			
SWD	Jerry Vilander (General Manager)			
SWD	Vinnie Coppola (Dam Keeper)			
Transportation Corridor Agencies (Toll Roads)	Lori Olin, Director, Communications			
Tustin Police Department	Stuart Greenberg (Chief of Police)			
Tustin Police Department	Sarah Fetterling (Sergeant, Community Resources Unit)			
Tustin Police Department	Stephen Foster (Emergency Operations Coordinator)			
Tustin Police Department	Non-Emergency Dispatch			
Villa Park (City of Villa Park)	Steve Franks, City Manager			
Villa Park (City of Villa Park)	Steve Strapac, City Engineer			
Water Emergency Response Organization of Orange County	Vicki Osborn (Director of Emergency Management)			
Westminster Police Department	Darin Lenyi (Police Chief)			

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-3300, Email Comments@IRWD.com

Organization	Name (Title)	Primary Phone #	Secondary Phone #	Email Address
Westminster Police Department	Robert Acosta			
Westminster Police Department	Non-Emergency Dispatch			
Fountain Valley Elementary School District <sup>a</sup>	Mark Johnson (Superintendent)			
Garden Grove Unified School District <sup>a</sup>	Gabriela Mafi			
Huntington Beach Union High School District <sup>a</sup>	Mark Hansberger (Dir. Maint., Transp. & Operations)			
Huntington Beach City School District <sup>a</sup>	Leisa Winston (Superintendent)			
Irvine Unified School District	Stephen Bayne (Director, Risk Management & Insurance)			
Newport-Mesa Unified School District <sup>a</sup>	Jonathan Wilby. (Director of Risk Management)			
Orange Unified School District <sup>a</sup>	Diana Gaeta (Director, Risk Management & Safety)			
Santa Ana Unified School District <sup>a</sup>	Camille Boden (Executive Director of Risk Management)			
Tustin Unified School District <sup>a</sup>	Sal Sanchez (Director, Maintenance and Operations)			

Phone numbers and email addresses have been removed from this publicly posted copy of this Emergency Action Plan. That information is available from Irvine Ranch Water District's district secretary: Phone 949-453-5300, Email Comments@IRWD.com

a. School districts have been included in this table so that copies of the EAP can be distributed to them for informational purposes.

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## Section 4: Project Description

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The Santiago Creek Dam was constructed in 1933. The dam impounds Irvine Lake, which stores imported water and local runoff. The water stored in Irvine Lake supplies drinking water and irrigation water. Irvine Lake is also used for recreation purposes by the general public.

The dam is an earthen dam with a crest length of 1,425 feet. DSOD has designated it an Extremely High Hazard Dam. The barrier height is 120 feet, as measured from the maximum water surface at the spillway crest elevation of 790 feet<sup>6</sup> to the estimated downstream toe at an elevation of 674 feet. The dam's upstream toe is at an elevation of about 680 feet. Above elevation 797.5 feet, the upstream face of the dam has a slope of 1.5:1. Below 797.5 feet, the upstream face of the dam has a slope of 2.5:1. Above elevation 790 feet, the downstream face of the dam is sloped at a 1.5:1 ratio, and below 790 feet, the downstream face is sloped at 2:1.

DSOD has not identified any CAS for Santiago Creek Dam. Figure 4-1 is a schematic of the reservoir, showing the dam, spillway, and outlet works. Overview and vicinity maps were presented in Figures 1-1 and 1-2, respectively.

The estimated capacity of the reservoir is 24,335 acre-feet at the spillway crest elevation of 790 feet. Stoplogs may be inserted at the spillway to raise the maximum water elevation to 794 feet, which results in a total capacity of 26,670 acre-feet. The storage capacity curve of the reservoir is included as *Figure 4-2 Irvine Lake Storage Capacity Curve*.

The drainage area upstream of the Santiago Creek Dam is 63.2 square miles. Irvine Lake collects natural runoff during the rainy season from this area, which is used as part of IRWD's water supply. The dam has an outlet tower that discharges into a 60-inch diameter welded steel pipe which is 592 feet long and splits into two pipes at the downstream toe of the dam. One pipe is 36-inch for regular conveyance, and the other is 30-inch for emergency releases.

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<sup>6</sup> Elevations used here are in the construction datum of the dam; to convert to North American Vertical Datum of 1988 (NAVD88), add approximately 1.9 feet to values in the construction datum.



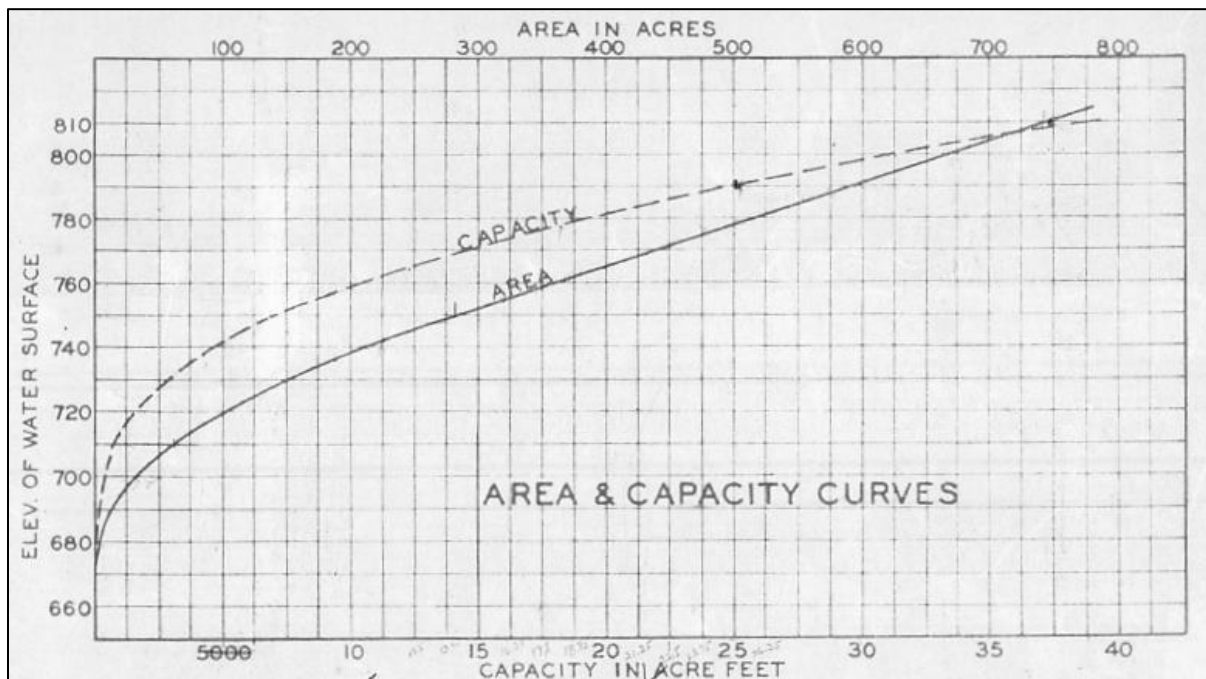
**Figure 4-1 Schematic of Santiago Creek Dam and Irvine Lake**

The Santiago Creek Dam has a spillway that discharges into a concrete-lined chute, which leads to an energy dissipator and a concrete channel which conveys water downstream to Villa Park Dam. The spillway is rated for 30,000 cubic feet per second (cfs). Though the spillway is not designated by DSOD as a CAS, it is included in DSOD's Spillway Re-Evaluation Program, a program enacted in 2017 that requires re-evaluation of certain spillways throughout California. IRWD and SWD completed the spillway re-evaluation study in two parts in 2018 and 2019 and concluded that the spillway is nearing the end of its useful life. IRWD and SWD are now actively proceeding with plans to replace the spillway. In addition, IRWD and SWD have an interim lake level operations plan which aims to minimize use of the spillway. During the winter season (October 31 - April 1), the lake operates with reduced water levels.

A dam failure at Santiago Creek Dam is expected to greatly exceed the capacity of the downstream channel. At a gage located downstream<sup>7</sup> of both Santiago Creek Dam and Villa Park Dam, a historical peak flow of 6,600 cfs was recorded on February 25, 1969. During this peak event, large storms caused high flows at Santiago Creek Dam and Villa Park Dam. Both reservoirs were filled to capacity by runoff, and as a result highway bridges and commercial and residential properties were damaged. Peak flows from a failure at Santiago Creek Dam would greatly exceed the historical peak flow.

<sup>7</sup> USGS Gage 11077500, Santiago Creek at Santa Ana, California

Discharge curves for the Santiago Creek Dam outlet pipes have not been prepared and preparation of them is outside the scope of this EAP.



**Figure 4-2 Santiago Creek Dam/Irvine Lake Storage Capacity Curve**

There are no jurisdictional dams upstream of Santiago Creek dam. There is one jurisdictional dam, Villa Park Dam, located downstream of Santiago Creek Dam. Villa Park Dam could be impacted by an incident at Santiago Creek Dam.

Villa Park Dam is a jurisdictional dam located downstream of Santiago Creek Dam. It is owned and operated by OCPW. It was constructed in 1963 to control spills from Irvine Lake and regulate flow from Santiago Creek to the Santa Ana River. The Villa Park Dam is an earthen embankment with an impervious fill core, consisting of two sections: a main section with a crest length of 1,460 feet, and an auxiliary section with a length of 1,420 feet. The crest of both sections is at 584.3 feet. There is a spillway located between the two sections, with a crest elevation of 566 feet. The capacity of Villa Park Dam is 15,600 acre-feet at the spillway crest, and 22,000 acre-feet at the maximum water level of 577 feet. The storage capacity curve of the reservoir is included as *Figure 4-3 Villa Park Dam Reservoir Storage Capacity Curve*.

A sudden and total failure of the Santiago Creek Dam may lead to a sequential failure at Villa Park Dam downstream. The inundation maps prepared for this EAP (see Part II) are based on a sequential failure analysis for both dams. The inundation maps reflect a worst-case scenario in which both reservoirs are full and both dams fail suddenly. No other downstream jurisdictional dams are within the inundation area of Santiago Creek Dam. There are no upstream jurisdictional dams which would impact Santiago Creek Dam.



If Santiago Creek Dam were to fail, the low-lying portions of south Orange, Villa Park, Santa Ana, North Tustin, Tustin, Fountain Valley, Garden Grove, Costa Mesa, Irvine, Huntington Beach and Newport Beach may be flooded. Portions of the state highway system could be inundated, including I-5, I-405, CA-22, CA-55, CA-57, and CA-261 (toll road). Many surface streets would also be inundated. High flows are expected in Santiago Creek, Santa Ana River, Peters Canyon Wash, San Diego Creek, and Upper Newport Bay.

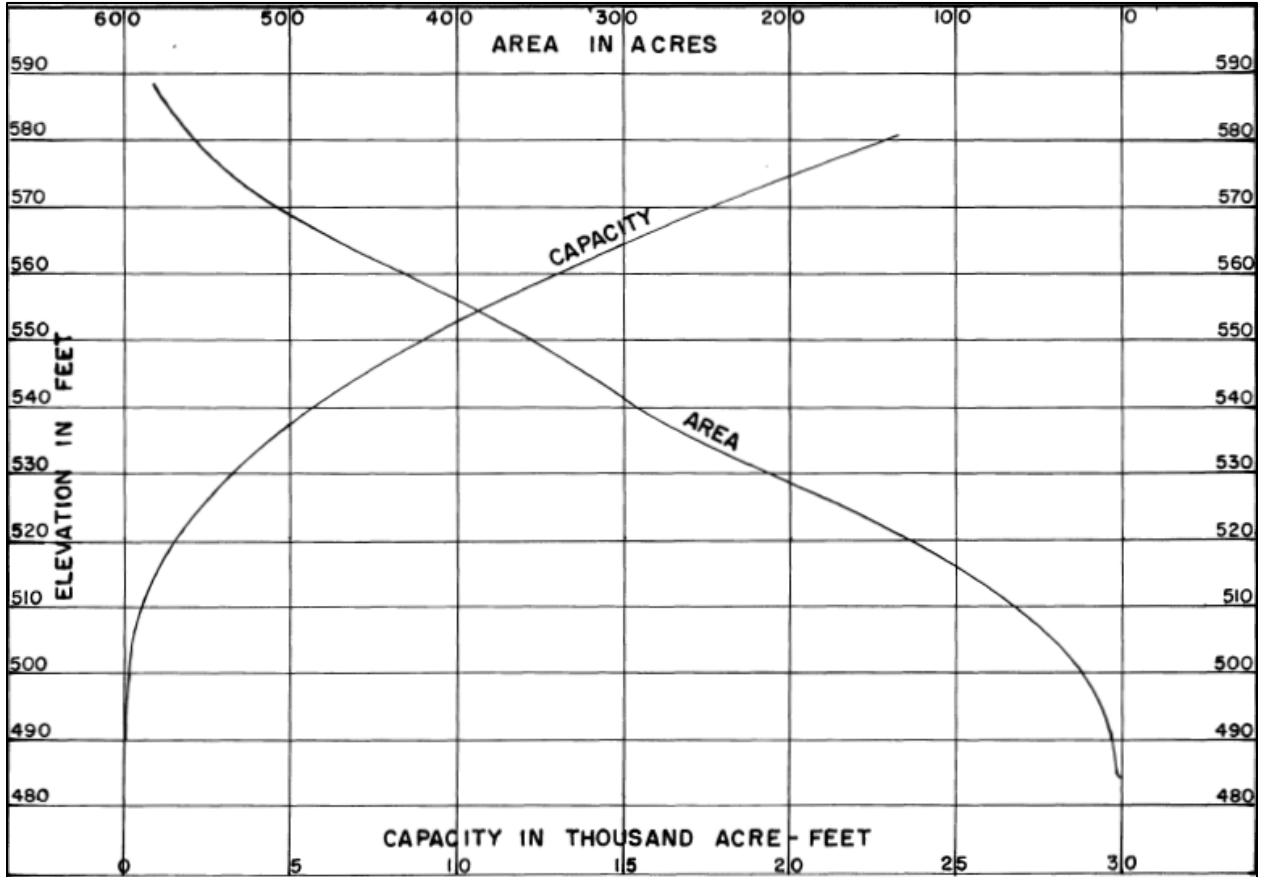


Figure 4-3 Villa Park Dam Reservoir Storage Capacity Curve

## Section 5: EAP Response Process

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There are four steps that should be followed when an unusual or emergency incident is detected at the dam. These steps constitute the EAP Response Process. The steps are:

- Step 1: Incident detection, evaluation and emergency level determination
- Step 2: Notification and communication
- Step 3: Emergency actions
- Step 4: Termination and follow up

Early detection and evaluation of the condition(s) or triggering event(s) that initiate or require an emergency response action are crucial. Timely determination of an emergency level ensures that the appropriate response actions are taken based on the urgency of the situation. Procedures for early notification are provided in Section 3 that allow all entities involved with plan implementation to respond appropriately. Preventive or mitigating actions must be taken to attempt to address conditions at the dam. Eventually, a determination will need to be made concerning termination of the incident. After the incident is over, follow-up activities may be required. All of these steps make up the general EAP response process and are discussed in the following sections.

### 5.1 Step 1: Incident Detection, Evaluation, and Emergency Level Determination

Step 1 involves emergency detection, evaluation, and incident classification. Regular surveillance at the site is the normal method of detecting potential emergency situations. For conditions beyond the normal range of operations, contact DSOD for assistance with evaluation.

#### 5.1.1 Monitoring, Detection, and Early Warning

This EAP establishes the procedures to be employed by IRWD personnel to ensure the safety of life and property at and downstream of the Santiago Creek Dam. There is a dam keeper who resides onsite, monitors the status of the reservoir, and maintains a presence at the dam. IRWD has a dam safety program which regularly monitors and inspects features of the dam to detect problems. This program includes:

- Monitoring of reservoir data in a SCADA system with alarms/alerts.
- Visual inspection of the dam on a daily basis.
- On-site dam keeper available to monitor and detect anomalies.
- Annual surveys of five survey monuments. Lateral and vertical displacement are compared to historical data to assess trends and detect anomalies.
- Measurement of water levels at 22 piezometers on a weekly basis. Measurements are compared to historical data to assess trends and detect anomalies.
- Annual inspections by IRWD/SWD staff.
- Annual inspections by DSOD.

Public access to the dam is restricted by locked gates and fencing. Areas of Irvine Lake are open to the public for recreation, but the general public does not have access on foot or vehicle to view or observe the dam. Because of this, any anomalies at the dam are expected to be detected by IRWD staff and not by the general public.

*Section 7: Preparedness* contains more details about how monitoring and detection instrumentation are used for incident preparedness.

### **5.1.2 Emergency Level Determination**

After identification of a dam threatening condition, the dam operator or a qualified engineer will determine if there is sufficient time for additional investigation before declaring an emergency situation. Prior to activating the EAP, the IRWD Operations Manager will determine the emergency level.

There are four dam safety emergency level categories for the Santiago Creek Dam. The sections below describe how each emergency level applies to the dam, and *Table 5-1 Emergency Level Determination* is provided for different incidents that pose dam safety hazards.

#### ***High Flow – High Flows in System, No Threat to Dam***

The High Flow emergency level indicates that flooding is occurring on the river system, but there is no apparent threat to the integrity of the dam. The High Flow emergency level is used by the dam owner to convey to outside agencies that downstream areas may be affected by the dam's release. Although the amount of flooding may be beyond the control of the dam owner, information on the timing and amount of release from the dam may be helpful to authorities in making decisions regarding warnings and evacuations.

The Villa Park Dam is downstream of Santiago Creek Dam, and was built to control high flows and flooding from Santiago Creek Dam.

#### ***Non-Failure – Unusual, Slowly Developing Event***

The Non-Failure emergency level is appropriate for an event at a dam that will not, by itself, lead to a failure, but requires investigation and notification of internal and/or external personnel. This classification indicates a situation is developing; however, the dam is not in danger of failing. In many cases, these unusual events are remedied with no further action required. In some cases, flow over spillways could cause unexpected flooding downstream, but the dam is not endangered. In cases of spillway releases, downstream residents may need to be notified if flooding threatens life or property, but it should be made clear that the dam is safe. Examples of Non-Failure events are (1) new seepage or leakage on the downstream side of the dam, (2) presence of unauthorized personnel at the dam, and (3) malfunction of an outlet valve in the open position creating the potential for high flow downstream of the dam or excessive erosion in the vicinity of the outlet works.

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***Potential Failure – Potential Dam Failure, Rapidly Developing***

This classification indicates that a situation is rapidly developing that could cause the dam to fail. A reasonable amount of time is available for analysis before deciding whether to evacuate residents. Emergency responders in affected areas will be alerted that an unsafe situation is developing. The Potential Failure emergency level indicates that conditions are developing at the dam that could lead to a dam failure. Examples of Potential Failure events are (1) rising reservoir levels that are approaching the top of the non-overflow section of the dam, (2) transverse cracking of an embankment, and (3) a verified bomb threat. Declaration of a Potential Failure should convey that time is available for analyses, decisions, and actions before the dam could fail. A failure may occur, but predetermined response actions may moderate or alleviate failure.

***Imminent Failure – Dam Failure Appears Imminent or In-Progress***

The Imminent Failure emergency level indicates that time has run out, and the dam has failed, is failing, or is about to fail. Imminent Failure typically involves a continuing and progressive loss of material from the dam. It is not usually possible to determine how long a complete breach of a dam will take. Therefore, once a decision is made that there is no time to prevent failure, the Imminent Failure warning must be issued. For purposes of evacuation, emergency management authorities may assume the worst-case condition that failure has already occurred.

**Table 5-1 Emergency Level Determination**

<b>Event</b>	<b>Example Situation</b>	<b>Emergency Level</b>
<b>Erosion of Spillway</b>	Spillway flowing with active erosion gullies	Potential Failure
	Spillway flowing with significant erosion and head cutting advancing rapidly toward reservoir	Imminent Failure
<b>Embankment Overtopping</b>	Reservoir level reaches higher than spillway crest and is increasing rapidly	Potential failure
	Water from the reservoir is flowing over the top of the dam	Imminent Failure
<b>Seepage</b>	New seepage areas in or near dam	Non-Failure
	New seepage areas with cloudy discharge or increasing flow rate	Potential Failure
	Seepage with increasing and significant flow rate	Imminent Failure
<b>Sinkholes</b>	Observation of new sinkhole in reservoir area or on embankment	Potential failure
	Rapidly enlarging sinkhole	Imminent failure
<b>Embankment Cracking or Settlement</b>	New cracks in embankment greater than 1/4-inch-wide without seepage	Non-Failure
	Cracks in the embankment with seepage	Potential Failure
<b>Embankment Movement</b>	Visual shallow slippage	Non-Failure
	Visual deep-seated movement/slippage of embankment	Potential Failure
	Sudden or rapidly proceeding slides of embankment slope	Imminent Failure
<b>Earthquakes</b>	Measurable earthquake reported within 50 miles of the dam	Non-Failure
	Earthquake resulting in visible damage to dam or appurtenances	Potential Failure
	Earthquake resulting in uncontrolled release of water over dam or rapidly developing flow through cracks or rapidly developing erosion through increased seepage	Imminent Failure
<b>Fire</b>	Significant fire in the area that affects access to the dam	Non-Failure
<b>Instruments</b>	Instrumentation readings beyond predetermined values	Non-Failure
<b>Outlet System Failure</b>	Releases causing erosion around outlet works	Non-Failure
	Uncontrolled releases through the outlet but the dam's structural integrity is still maintained	Potential Failure
	Uncontrolled releases through the outlet with dam failure imminent	Imminent Failure
<b>Security Threat</b>	Verified bomb threat that, if carried out, could result in damage to the dam	Potential failure
	Detonated bomb that has resulted in damage to the dam or appurtenances	Imminent failure
<b>Sabotage/ Vandalism</b>	Damage that could adversely impact the functioning of the dam	Non-failure
	Damage that has resulted in seepage flow	Potential failure
	Damage that has resulted in uncontrolled water release	Imminent failure

## 5.2 Step 2: Notification and Communication

After the emergency level at the dam has been determined, notifications are made in accordance with the appropriate notification flowcharts in Section 3. The three notification flowcharts were prepared to assist EAP response personnel during an emergency. Each chart identifies who is responsible for notifying representatives and/or emergency management officials; the prioritized order in which individuals are to be notified; and who is to be notified. A contact list for the flowchart contacts, as well as other affected parties is found in Section 3.2.

During a dam safety incident, the observer of the dam incident will call 911 and/or the dam operator. If local 911 (primary local emergency management) is called first, they will then notify the dam operator. If the dam operator is notified first, they will ensure that primary local emergency management is also aware of the situation. Once the appropriate emergency level has been determined, the flowchart corresponding to that level will be used to inform affected parties of the situation as it progresses. Parties at the start of each branch are responsible for making all calls within that branch, in the order indicated. Positive contact is required. If it is not possible to contact a particular party based on the information given in the flowchart, the notifying party should refer to the contact table provided in Section 3.2.

The notification flowcharts (Section 3.1) require that the primary local emergency management agency, City of Irvine Police Department, make additional calls as part of the notification process. City of Irvine Police Department has agreed to perform the responsibilities in the notification flowcharts and in this EAP. These instructions will be updated annually when the plan is reviewed and contacts are updated (see Section 8.1).

When performing notification and communication activities, it is important that people speak in clear, non-technical terms to ensure that those being notified understand what is happening at the dam, what the current emergency level is, and which actions to take. To assist in this step, pre-scripted messages are available in Appendix E. Additionally, fill out the Cal OES Warning Center Dam Incident Report (Appendix I) and use it for initial notifications.

Use the Contact Log (Appendix D) to track required notifications that are attempted or made. The contact information on each notification flowcharts must be updated annually by the dam owner's/operator's representative.

In the event of an emergency, IRWD will coordinate closely with emergency management authorities. All parties must understand that the formal declaration of public emergency by emergency management authorities can be a very difficult decision. During this step, IRWD will provide any information that will assist in that decision. An early decision and declaration are critical to maximizing available response time.

## 5.3 Step 3: Emergency Actions

After the initial notifications have been made, IRWD will act to save the dam and minimize impacts to life, property, and the environment. A Unified Command will be established to coordinate emergency response and/or evacuations. During this step, there is a continuous process of taking actions, assessing the status of the situation, and keeping others informed through communication channels established during the initial notifications. Additional resources

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may be requested through the County and OA EOC if requirements exceed the IRWD internal maintenance, construction, and contracting capabilities.

*Table 5-2 Possible Remedial Actions* provides the dam owner/operator with a set of actions to take for different events. The actions listed are not all inclusive of those that may need to be taken during an emergency. Use the Emergency Incident Log (Appendix F) to document the emergency event.

**Table 5-2 - Possible Remedial Actions**

<b>Condition</b>	<b>Description of Condition</b>	<b>Action to be Taken</b>
<b>Large Spillway Release/High Water Level</b>	Reservoir level reaches elevation 790 feet (spillway begins to discharge).	1. Cease filling operations unless overfilling and spillway discharge is planned. Close inlet valves.
		2. If inlet valves have malfunctioned and cannot be closed, contact maintenance crews for immediate repair. Determine if inlet flowrate exceeds the spillway discharge capacity. If not, monitor spillway for signs of excessive erosion, and determine whether a high flow condition may exist downstream. Make notifications as appropriate.
<b>Seepage</b>	Localized new seepage or boils observed along downstream face / toe of earthen embankment with muddy discharge and increasing but controllable discharge of water	1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report.
		2. Place a ring of sand bags with a weir at the top towards the natural drainage path to monitor flow rate. If boil becomes too large to sand bag, place a blanket filter over the area using non-woven filter fabric and pea gravel. Attempt to contain flow in such a manner (without performing any excavations) that flow rates can be measured. Stockpile gravel and sand fill for later use, if necessary.
		3. Inspect the dam and collect piezometer, water level and seepage flow data daily unless otherwise instructed by engineer. Record any changes of conditions. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement.
		4. Contact geotechnical engineer and provide all data collected.
		5. Maintain continuous monitoring of feature. Record measured flow rate and any changes of condition, including presence or absence of muddy discharge.



Condition	Description of Condition	Action to be Taken
<b>Seepage (cont.)</b>	Localized new seepage or boils (cont.)	6. Review information collected by field inspection and provide additional instructions / actions as required. Recommend remedial seepage and stability measures.
		7. Make notifications if condition worsens such that failure is imminent.
<b>Sabotage and Miscellaneous Other Issues</b>	Criminal action with significant damage to embankment or structures where significant repairs are required and the <b>integrity of the facility is compromised – condition appears stable with time.</b>	1. Contact law enforcement authorities and restrict all access (except emergency responders) to dam. Restrict traffic on dam crest to essential emergency operations only.
		2. Assess extent of damage and visually inspect entire dam for additional less obvious damage. Based on inspection results, confirm if extent of damage to various components of the dam warrants revised emergency level and additional notifications.
		3. Perform additional tasks as directed by the Engineering Supervisor or designee.
		4. Make notifications if conditions worsen.
<b>Earthquakes</b>	Report of an earthquake epicenter within 50 miles	Inspect dam and evaluate the damage sustained and the potential danger of failure. Check for seepage, cracks, displacements, and settlement. Inspect outlet works and spillways. Evaluate instrumentation.
<b>Erosion of Spillway</b>	Erosion or undermining of concrete spillway	Provide temporary protection at the point of erosion by placing sandbags, riprap materials, or plastic sheets weighted with sandbags. Consider pumps and siphons to help reduce the water level in the reservoir. When inflow subsides, lower the water level in the reservoir to a safe level; continue operating at a lower water level to minimize spillway flow.
<b>Fire</b>		Implement fire procedures (if applicable).

Condition	Description of Condition	Action to be Taken
<b>Abnormal Instrumentation Reading</b>	Piezometers, monuments, and seepage measurements are outside of established dam safety parameters.	Conduct daily inspections of the dam. Check and record reservoir elevation, rate at which reservoir is rising, weather conditions (past, current, forecasted), discharge conditions of creeks/ivers downstream, and new or changed conditions associated with this event. Evaluate accuracy of instrumentation.
<b>Outlet System Failure</b>	Failure of the outlet system piping at a point inside the dam foundation.	Implement temporary measures to protect the damaged structure, such as closing the inlet. Lower the water level in the reservoir to a safe elevation, possibly by using pumps or siphons. Consider the severity of flow through outlet, risk to the dam foundation/liner and increased flows in determining emergency level.
<b>Embankment Deformation</b>	<p><b>Cracks:</b> New longitudinal (along the embankment) or transverse (across the embankment) cracks more than 6 inches deep or more than 3 inches wide or increasing with time. New concave cracks on or near the embankment crest associated with slope movement.</p>	<ol style="list-style-type: none"> <li>1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report.</li> <li>2. Restrict traffic on dam crest to essential emergency operations only.</li> <li>3. Contact geotechnical engineer and provide all data collected.</li> <li>4. Place buttress fill (min 3 feet high, 15 feet wide) against base of slope immediately below surface feature and extending 20 feet beyond visible feature limits (parallel to the embankment). Stock pile additional fill.</li> <li>5. Place sand bags as necessary around crack area to divert any storm water runoff from flowing into crack(s).</li> <li>6. Inspect the dam; collect piezometer and water level data twice daily unless otherwise instructed by engineer; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement.</li> <li>7. Review information collected by field inspectors and provide additional instructions / actions as required. Consider survey monitoring.</li> <li>8. Make notifications if conditions worsen such that failure is imminent.</li> </ol>

Condition	Description of Condition	Action to be Taken
<p><b>Embankment Deformation (cont.)</b></p>	<p><b>Slides / Erosion:</b> Deep slide / erosion (greater than 2 feet deep) on the embankment that may also extend beyond the embankment toe but does not encroach onto the embankment crest and appears stable with time.</p>	<p>1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report.</p>
		<p>2. Restrict traffic on dam crest to essential emergency operations only.</p>
		<p>3. Contact geotechnical engineer and provide all data collected.</p>
		<p>4. Re-establish embankment fill slope. Place 5 feet. high buttress fill against base of slope at the slide location that extends at least 15 feet. beyond the furthest downstream limits (perpendicular to the embankment) and extending 20 feet. beyond visible feature limits at either end (parallel to the embankment).</p>
		<p>5. Place sand bags as necessary around slide area to divert any storm water runoff from flowing into slide(s).</p>
		<p>6. Inspect the dam; collect piezometer and water level data daily unless otherwise instructed by engineer; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement.</p>
		<p>7. Review information collected by field inspectors and provide additional instructions / actions as required. Consider survey monitoring.</p>
		<p>8. Make notifications if conditions worsen such that failure is imminent.</p>
	<p><b>Sinkholes:</b> Small depression observed on the embankment or within 50 feet of the embankment toe that is less than 5 feet deep and 30 feet wide or which is increasing with time.</p>	<p>1. Lower reservoir elevation.</p>
		<p>2. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos if camera is available. Document location on a site plan and in inspection report.</p>
<p>3. Restrict traffic on dam crest to essential emergency operations only.</p>		
<p>4. Contact geotechnical engineer and provide all data collected.</p>		

Condition	Description of Condition	Action to be Taken
<p><b>Embankment Deformation (cont.)</b></p>	<p><b>Sinkholes (cont.):</b></p>	<p>5. Backfill the depression with relatively clean earth fill (free of organic materials) generally even with surrounding grade and slightly mounded (6 to 12 inches higher) in the center in order to shed storm water away from the depression. Stock pile additional fill.</p>
		<p>6. Inspect the dam; collect piezometer and water level data daily unless otherwise instructed by engineer; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement.</p>
		<p>7. Review information collected by field inspectors and provide additional instructions / actions as required. Consider remedial construction such as grouting.</p>
		<p>8. Make notifications if conditions worsen such that failure is imminent.</p>

## 5.4 Step 4: Termination and Follow-up

Once conditions indicate that there is no longer an emergency at the dam site, EAP operations are terminated and follow-up actions are completed. Generally, IRWD or a designated safety expert will be responsible for notifying the Unified Command that the condition of the dam has been stabilized.

The IRWD General Manager, in consultation with the IRWD operations and engineering staff members, dam safety experts, and response personnel, is responsible for determining when the dam safety situation has stabilized. The General Manager will terminate the EAP, which signifies that the dam incident has been resolved at the dam site.

The IRWD Operations Manager will follow the notification flowchart to alert all contacts of the EAP's termination. The Operations Manager will complete the Termination Log (Appendix G).

The Unified Command is responsible for terminating the field level emergency response and relaying this decision to appropriate individuals and agencies. Prior to the termination of an Imminent Failure event that has not caused actual dam failure, DSOD will inspect the dam to determine whether any damage has occurred that could potentially result in loss of life, injury, or property damage.

Post incident, the EAP Coordinator will set up and facilitate a meeting to review the incident and EAP implementation activities. The dam personnel involved with the plan implementation, as well as the responding agencies should be present at the meeting. The following topics will be discussed and evaluated in an after-action review:

- Events or conditions leading up to, during, and following the incident
- Significant actions taken by each participant and improvements for future emergencies
- All strengths and deficiencies found in the incident management process, materials, equipment, staffing levels, and leadership
- Corrective actions identified and a planned course of action to implement recommendations

IRWD will prepare an after-action report (Appendix H), which analyzes what happened, why it happened, and how it can be prevented in the future from a dam safety and/or EAP perspective. OCSD, OCFA, and the County and OA EOC Manager may prepare a separate after-action reports focused on localized emergency response and evacuation. Outside agencies will be invited to contribute to the after-action report, and findings of the report will be used to improve the EAP.

## Section 6: General Responsibilities

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### 6.1 Irvine Ranch Water District and Serrano Water District Responsibilities (Dam Owner)

Overall IRWD/SWD dam owner responsibilities include:

- Detect, verify and assess emergency conditions
- Respond to emergencies at the dam site
- Activate and implement the Santiago Creek Dam EAP, including determining the appropriate emergency level.
- Notify other participating emergency management agencies of emergency conditions, emergency level, EAP activation, and other critical information
- Take corrective action at the dam/reservoir
- Terminate the EAP
- Facilitate an after-action evaluation and report
- Update EAP on at least an annual basis
- Communicate with the public and the media

The above responsibilities are to be executed in coordination with emergency management authorities. Dam owner responsibilities by role are outlined in *Table 6-1 Summary of Dam Owner's Responsibilities*. Responsibilities are listed for key personnel including the Operations Manager, Dam Operator, Executive Director of Operations, General Manager, Public Affairs, and EAP Coordinator.

IRWD, as the dam owner and operator, is responsible for developing and maintaining the EAP. This includes updating the EAP on at least an annual basis, including updating contact information and notification charts in Section 3. The dam owner is responsible for regular monitoring and inspections of the dam and for responding to emergencies at the dam.

As the dam owner, IRWD will carry out notifications as outlined in Section 6.2, including to the primary local emergency management, state emergency management, and the NWS. Notification charts and procedures are given in Section 3. IRWD's Public Affairs office will communicate with the public and the media. If needed, IRWD will procure outside equipment and materials to aid with a dam incident or emergency.

**Table 6-1 Dam Owner Responsibilities by Role**

<b>Role</b>	<b>Responsibilities</b>
<b>IRWD Operations Manager</b>	<ol style="list-style-type: none"> <li>1. Detect incident from alarms / SCADA / visual inspections, or other monitoring data.</li> <li>2. As soon as an emergency event is observed or reported, immediately determine the emergency level as detailed in Section 5.</li> <li>3. Utilize the emergency notification flowcharts in Section 3 to notify the appropriate response personnel and record notifications in the contact log in Appendix D.</li> <li>4. If no one is onsite, determine emergency level and dispatch operator to the site</li> <li>5. Coordinate directly with the IC or first responders at the dam site.</li> <li>6. Coordinate directly with the ICP or County and OA EOC.</li> <li>7. Coordinate with Dam Operator on gate, valve operations and emergency procedures</li> <li>8. Dispatch construction and maintenance crews as necessary</li> <li>9. Procure outside equipment and materials as necessary</li> <li>10. Provide regular status reports to senior management</li> <li>11. Upon termination of EAP by General Manager, notify all entities on notification charts</li> <li>12. Upon termination of EAP by General Manager, fill out a Dam Emergency Termination Log (Appendix G)</li> <li>13. Participate in the creation of an After-Action Report (Appendix H) to be used in the EAP review process.</li> </ol>
<b>Dam Operator/ On-site Monitor</b>	<ol style="list-style-type: none"> <li>1. Detect/confirm incident at dam</li> <li>2. Implement gate and valve operations and other emergency procedures</li> <li>3. Assess need for construction and maintenance crews and/or outside equipment and materials</li> <li>4. Coordinate dam site security during incident</li> </ol>
<b>Executive Director of Operations</b>	<ol style="list-style-type: none"> <li>1. Make calls on notification charts</li> <li>2. Initiate periodic status report conference calls with dam operator, Operations Manager, and Public Affairs</li> <li>3. Provide regular status reports to ICP or County and OA EOC</li> <li>4. Coordinate with Public Affairs office</li> </ol>
<b>General Manager</b>	<ol style="list-style-type: none"> <li>1. Initiate periodic status report conference calls with dam operator, Operations Manager, and Public Affairs.</li> <li>2. Provide regular status reports to ICP or County and OA EOC</li> <li>3. Notify government authorities when the dam condition has been stabilized.</li> <li>4. Terminate the EAP</li> <li>5. Coordinate with Public Affairs office</li> </ol>
<b>Public Affairs</b>	<ol style="list-style-type: none"> <li>1. Mobilize to County and OA EOC.</li> <li>2. Participate in periodic status report conference calls with dam operator, Operations Manager, and management</li> <li>3. Provide input to staff on emergency communications</li> <li>4. Represent IRWD to media</li> </ol>
<b>EAP Coordinator</b>	<ol style="list-style-type: none"> <li>1. Update EAP at least annually</li> <li>2. Distribute EAP copies/updates to other plan holders</li> <li>3. Facilitate the creation of an After-Action Report (Appendix H)</li> </ol>

## 6.2 Notification and Communication Responsibilities

IRWD and SWD, as the dam owner/operators, will determine the appropriate emergency level in accordance with Section 5, then notify the appropriate emergency management authorities in accordance with Section 3. The dam operator or IRWD operations center will maintain the contact log (Appendix D) to document notifications for the appropriate emergency level.

IRWD's Operations Manager will notify the NWS of an emergency at Rattlesnake Canyon Dam. Flood warnings and watches will be issued by the San Diego Weather Forecast Office of the NWS (see notification charts in section 3.1).

IRWD's Executive Director will notify the State Emergency Operations Center and DSOD (see notification charts in section 3.1). IRWD's Public Affairs office will be responsible for communication with the media.

If time allows, onsite personnel may be able to seek internal advice and assistance. However, under an Imminent Failure condition, the responsibility and authority for notification is delegated to the dam operator or local official. Notification protocols are determined by the classification level of the incident and are pre-determined in the notification flowcharts found in Section 3.

For an incident at Santiago Creek Dam, a Unified Command will be established in order to coordinate between multiple jurisdictions and/or agencies. IRWD is designated as the lead agency for notification to OCSO Control One, which will then initiate notifications and coordination with other affected jurisdictions. Once notified of an incident at the dam, the County and OA EOC may be activated to serve as the center for response, warning, and evacuation activities.

Flood warnings and watches will be issued by the San Diego Weather Forecast Office of the National Weather Service.

Emergency management authorities with statutory obligations are responsible for warning and evacuation within the affected areas (see Part II Inundation Maps).

Emergency incident logs should be used to document incident related events and should be maintained at command centers and at the dam site or dam operations center. Appendix F contains an example emergency incident log.

## 6.3 Evacuation Responsibilities

Electronic copies of the inundation maps developed by IRWD and approved by DSOD are included in the CD attached as Part II of this EAP, and have been distributed to the emergency management authorities listed in the notification flowcharts in Section 3. The EAP distribution list may be found in Appendix C. These maps inform the development and refinement of warning and evacuation plans, and are based on the worst-case scenario of a complete and sudden failure of both Santiago Creek Dam and Villa Park Dam when they are both filled to the spillway crest elevation during a "sunny day" failure, without additional storm flows in Santiago



Creek or Santa Ana River. Water levels in Irvine Lake fluctuate throughout the year. Inundation maps are based on conservative breach parameters and a situation where each reservoir is storing the maximum capacity of water. Therefore, the inundation maps included in Part II of this EAP should be considered a worst-case scenario.

The Unified Command will facilitate coordination among agencies and disciplines for evacuations in downstream jurisdictions. If Santiago Creek Dam were to fail, evacuations may be necessary in unincorporated areas of Orange County, and the cities of Orange, Villa Park, Garden Grove, Santa Ana, Tustin, Westminster, Costa Mesa, Fountain Valley, Huntington Beach, and Irvine. Within each of these jurisdictions, evacuations will generally be the responsibility of the police and fire public safety agencies that have jurisdiction in each (see Table 1-1):

- Unincorporated Orange County: OCSD and OCFA
- City of Orange: Orange Police Department and Orange Fire Department
- City of Villa Park: OCSD and OCFA
- City of Garden Grove: Garden Grove Police Department and OCFA
- City of Santa Ana: Santa Ana Police Department and OCFA
- City of Tustin: Tustin Police Department and OCFA
- City of Westminster: Westminster Police Department and OCFA
- City of Fountain Valley: Fountain Valley Police Department and Fountain Valley Fire Department
- City of Costa Mesa: Costa Mesa Police Department and Costa Mesa Fire and Rescue
- City of Irvine: Irvine Police Department and OCFA
- City of Newport Beach: Newport Beach Police Department and Newport Beach Fire Department
- City of Huntington Beach: Huntington Beach Police Department and Huntington Beach Fire Department

The Unified Command will coordinate such evacuations, and will use their discretion to deploy resources.

Evacuations are not anticipated in the City of Seal Beach.

## **6.4 Monitoring, Security, Termination, and Follow-up Responsibilities**

The dam operator or an appointed representative will be designated as the onsite monitor from the beginning of a dam safety incident until the emergency has been terminated. This person will provide status updates to the IRWD Operations Manager, who will provide regular status reports to senior management and local authorities.

During a dam safety incident, the IRWD onsite monitor will oversee security at the dam site. Access to the dam site will be strictly controlled by IRWD. Only those required to respond to the emergency or execute remedial actions will be granted access to the site.

Termination of a dam safety emergency is twofold. The IRWD General Manager, in consultation with IRWD operations and engineering staff members, dam safety experts, and response personnel, is responsible for determining when the dam safety situation has stabilized. The

IRWD General Manager will officially terminate the EAP. The Unified Command is responsible for termination of the emergency response activities, including termination of an evacuation.

The dam owner and emergency response authorities should coordinate closely while making decisions to terminate both the dam safety event and the response efforts. Upon termination of the EAP, IRWD's Operations Manager will notify all flowchart entities which were activated at the start of the emergency incident, and complete an Emergency Termination Log (Appendix G) for submission to DSOD and the Cal OES Warning Center (if notified).

Recovery activities will continue on different levels for all involved in the dam safety incident after the emergency has been terminated. IRWD will coordinate a follow-up evaluation after any emergency and prepare an after-action report. All participants in the dam safety incident should be involved in the evaluation and should keep logs during the incident. An example emergency incident log is provided in Appendix F, although emergency response agencies may maintain alternate documentation methods according to their established internal procedures.

IRWD's EAP Coordinator will prepare an after-action report (Appendix H), which analyzes what happened, why it happened, and how it can be prevented in the future from a dam safety and/or EAP perspective. OCFA and the County and OA EOC Manager may prepare a separate after-action report focused on the emergency response and evacuation.

## **6.5 EAP Coordinator Responsibilities**

IRWD has designated the IRWD Director of Safety and Security as the EAP Coordinator. The EAP coordinator is responsible for overall EAP related activities, including the following:

- Provide leadership to ensure the EAP is reviewed and updated annually.
- Coordinate annual EAP exercises (see Section 7.2.2 for exercise schedule).
- Summarize the annual EAP exercise for posting to the IRWD website.
- Prepare revisions to the EAP after annual exercise and review.
- Verify and update agency contact information.
- Distribute copies of the revised EAP to all parties who received copies of the original EAP.
- Establish training seminars for IRWD personnel and primary emergency management authorities.
- Coordinate emergency outreach programs with residents and businesses in close proximity to the reservoir.
- After a dam safety incident, hold a meeting to review the incident and EAP implementation activities.
- Facilitate the creation of an After Action Report (Appendix H) after a dam incident by gathering incident information from authorities.
- Utilize any After Action Reports during EAP review process.

The EAP Coordinator is the main point of contact for any questions or comments regarding this EAP. The current EAP Coordinator for IRWD is Steve Choi, who can be reached at:

Steve Choi, Director of Safety and Security  
Irvine Ranch Water District

# Section 7: Preparedness

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## 7.1 Surveillance and Monitoring

This EAP establishes the procedures to be employed by IRWD/SWD personnel to ensure the safety of life and property at and downstream of Santiago Creek Dam. The Water Operations Manager is responsible for the day to day operation of the reservoir and the dam surveillance and monitoring program. Operations are supported by IRWD/SWD maintenance activities. There is a dam keeper who resides at the reservoir and is responsible for maintaining a presence at the dam, monitoring water levels, ensuring the facility is properly secured, and conducting visual inspections. The reservoir is a source of supply for the IRWD and SWD water systems, and is filled by runoff from its drainage area. IRWD leads a surveillance and inspection program for the Santiago Creek Dam that is described in the sections that follow. Monitoring and surveillance data is reviewed by an independent consultant and annual reports are prepared and maintained on file with IRWD. The reservoir site plan is included as *Figure 7-1 Santiago Creek Dam Site Plan*. A typical dam cross section is shown in *Figure 7-2 Santiago Creek Dam Cross Section*.

### 7.1.1 SCADA

IRWD has a supervisory control and data acquisition (SCADA) system that allows staff to remotely monitor water levels and alarms at Santiago Creek Dam.

### 7.1.2 Survey Monuments

Santiago Creek Dam has 5 survey benchmarks. Elevation and net horizontal displacement are measured annually at each benchmark. The survey data are compared to historical data and graphs are prepared that indicate movement of the monuments over time. Lateral or vertical shifting of the monuments is indicative of a potential dam safety issue and requires further investigation. DSOD reviews the annual surveys.

### 7.1.3 Piezometers

A piezometer is a small-diameter well used mainly to measure water levels. There are currently a total of 22 piezometers that are being monitored at Santiago Creek Dam. The water levels in the piezometers are measured by SWD personnel generally on a weekly basis. Water levels in the piezometers are compared to reservoir surface water elevations and evaluated against data collected over a 10-year historical period. Anomalies in the piezometer data may be an indication of adverse conditions in the dam embankment or abutments.

### 7.1.4 Visual Surveillance and Monitoring

Visual inspections are conducted daily by the dam keeper that consist of monitoring the water surface elevation, inspecting visible appurtenances, inspecting the access roadway and spillway for cracking, inspecting the downstream toe for seepage, and inspecting the slopes and crest

parapet wall for any visible displacement. Any visible cracking, seepage, or signs of settlement or instability are reported and trigger further investigation of the piezometers and monuments or engineering analysis. All of the outlet gates and blow off valves are exercised at least annually to confirm operability. DSOD requires the outlet valves and blow-off valves be exercised once every three years in the presence of a DSOD representative.

Maintenance is conducted as required to remove excessive vegetation at or near the spillway or on the dam face and to control rodent activity on the dam face.

#### **7.1.5 IRWD/SWD and DSOD Inspections**

Annual inspections are documented and maintained on file at both IRWD and DSOD. DSOD inspections are conducted annually. Visual inspections of the dam, spillway, outlet, and seepage are conducted, along with a review of monitoring and surveillance data. IRWD provides inspection reports on their website at:

<https://www.irwd.com/construction/dam-safety-program>

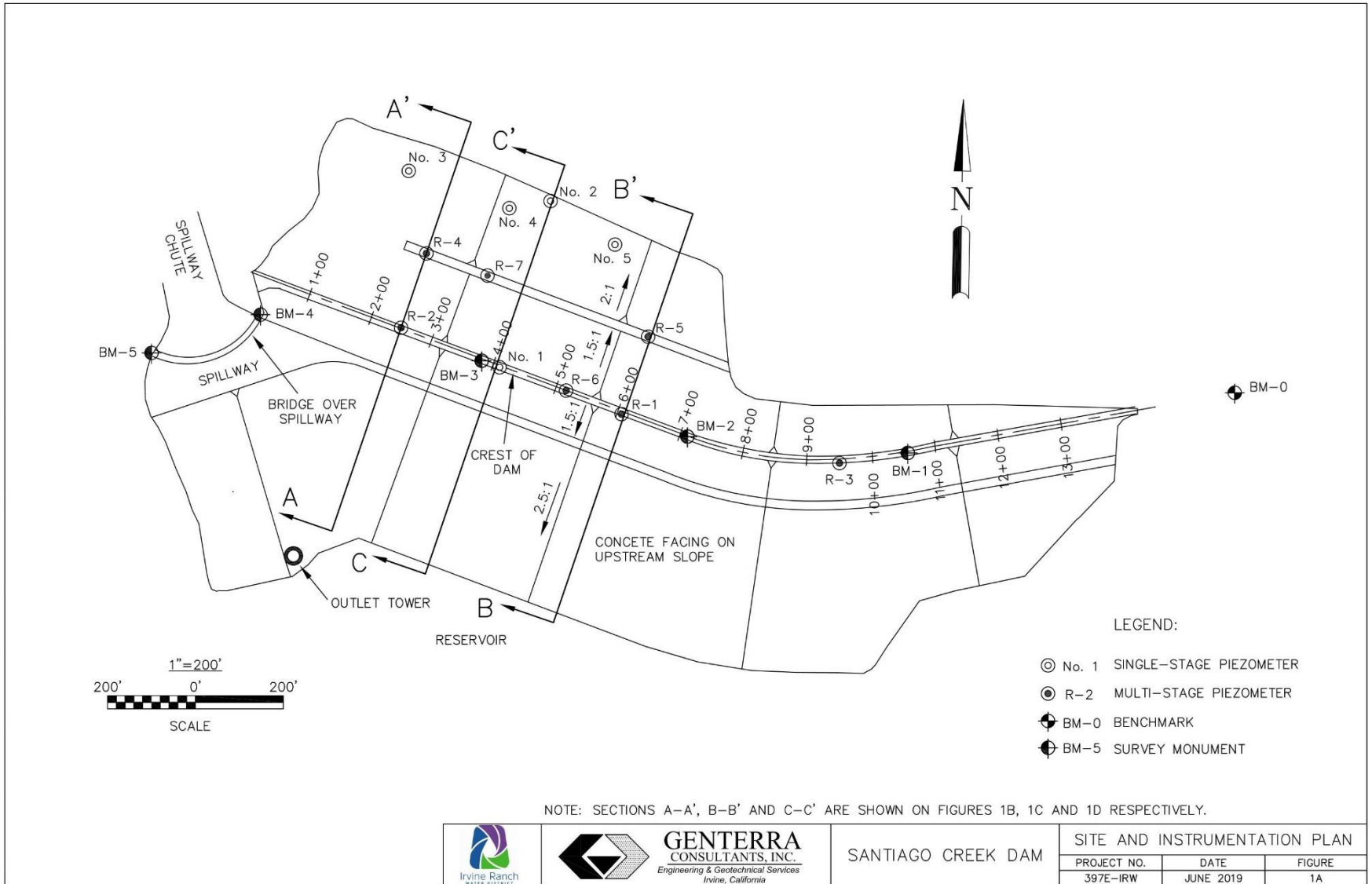


Figure 7.1-1 Santiago Creek Dam Site Plan

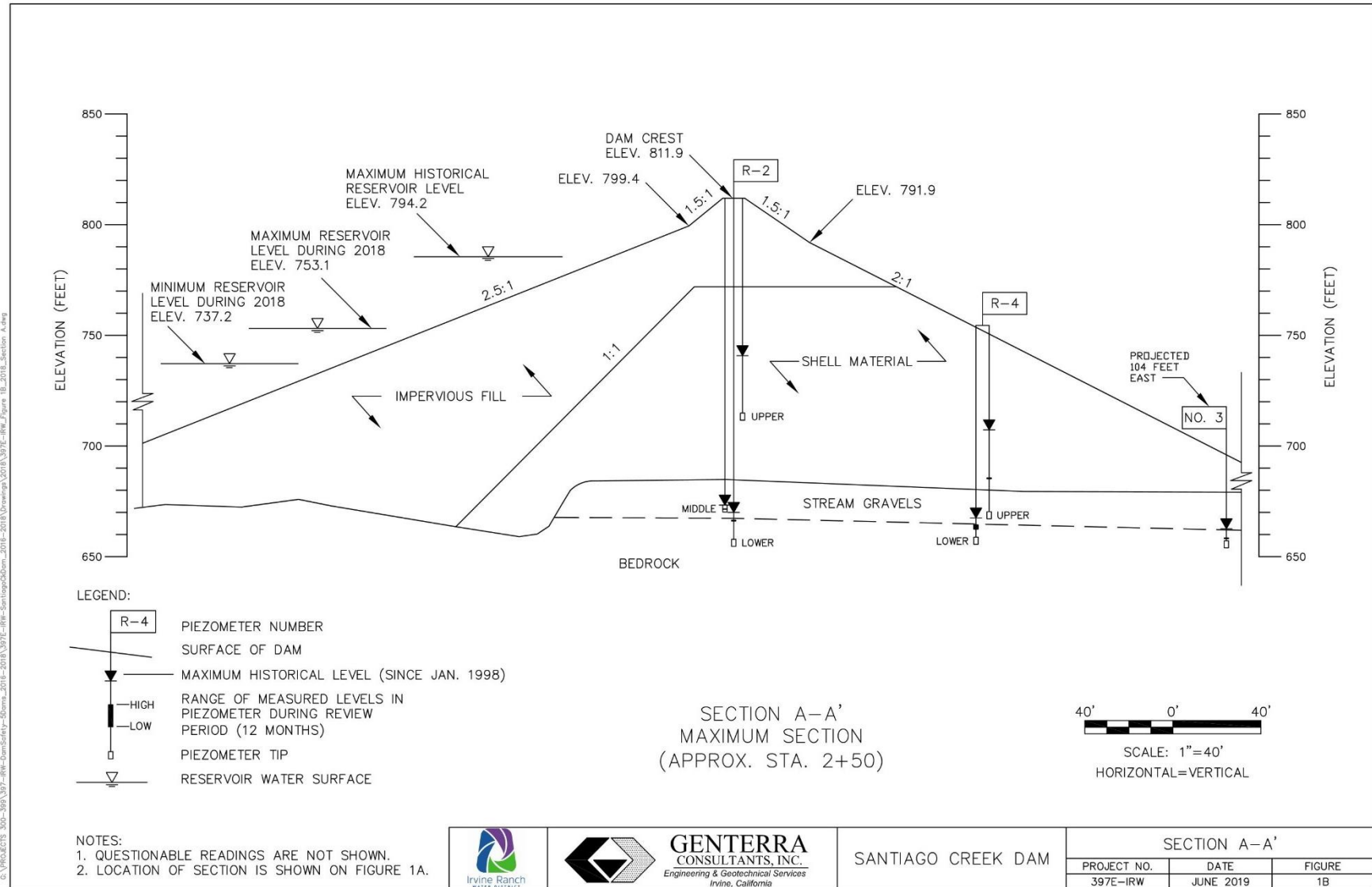


Figure 7.1-2 Santiago Creek Dam Cross Section

## **7.2 Evaluation of Detection and Response Timing**

Timely implementation of the EAP and coordination and communication with emergency management authorities are crucial elements in the effectiveness of the emergency response effort. Total EAP implementation time from the initiation of an actual incident to determination of an emergency situation and notification of appropriate entities involved with implementation is evaluated through annual exercises and training. The time from the initial detection of an incident through the determination of the emergency level and execution of the notifications to the appropriate entities should take no more than 60 minutes. The initial detection and notification time will be evaluated during IRWD's annual review and exercises (see Section 7.2.2), and may be updated in subsequent EAP revisions.

### **7.2.1 Training**

All personnel involved in the EAP should be familiar with the elements of the plan, their responsibilities and duties outlined in the plan and, if applicable, the types and availability of equipment during an emergency. Personnel should be familiar with problem detection and evaluation, and appropriate remediation actions, as detailed in this EAP.

### **7.2.2 Annual Review and Exercises**

IRWD will review and, if needed, update the EAP at least once annually leading up to the emergency action plan notification exercise described below. This review includes contacting all parties listed in this EAP to verify that contact names, phone numbers, addresses and other information is current. One of the most important tasks is to verify and update the contacts listed in the Emergency Notification Flowcharts in Section 3. Making updates to locally available resources along with the other information in the EAP is also important so that accurate information is readily available during an emergency.

In accordance with California Government Code Section 8589.5(c), at least once annually, IRWD will conduct an emergency action plan notification exercise with local public safety agencies, to the extent that a local public safety agency wishes to participate. This annual exercise is to ensure that emergency communications plans and processes are current and implemented effectively.

Exercises will follow the types of exercises defined in the Homeland Security Exercise and Evaluation Program (HSEEP), beginning with simple exercises and advancing to more complex exercises. Sufficient time should be provided between each exercise to learn and improve from the experiences of the previous exercise. IRWD, as the dam owner/operator, will coordinate with OCSD, OCFA, and other downstream jurisdictions in order to exercise the EAP. Exercises promote prevention, preparedness, and response to incidents and emergencies. Exercises may also be extended to include recovery operations. Periodic exercises result in an improved EAP as lessons learned are incorporated into the updated EAP document. The frequency and level of exercise will be determined in coordination with the OCFA, the OCSD EMD and other local emergency response organizations.

The following are recommended frequencies for the exercise types described in the HSEEP:



- Seminars with primary emergency management authorities as part of the annual emergency action plan notification exercise – annually.
- Drills to test the notification flowcharts in Section 3 and emergency equipment/procedures (emergency action plan notification exercise) – annually.
- Tabletop exercise – every 3 to 4 years or before functional exercises.
- Functional exercise – every 5 years.
- Full scale exercise – as required to evaluate actual field movement and deployment. At least one functional exercise should be conducted before conducting a full-scale exercise.

Functional and full-scale exercises should be coordinated with other scheduled exercises, whenever possible, to share emergency management resources and reduce costs.

### 7.3 Access to the Site

Access to the Santiago Creek Dam can be coordinated with the dam operator at the numbers provided in the notification flowcharts in Section 3. Depending on the dam safety incident, IRWD/SWD may establish an operations center to coordinate dam safety response activities and provide information to other emergency response personnel. The dam is located at Irvine Lake in Orange County, and can be accessed from an access road in Irvine Regional Park, an access road on East Santiago Canyon Road, or from Oak Canyon Park. Vehicle access to the area around the dam is restricted via locked gates and fencing. However, the east side of the reservoir near Oak Canyon Park is open to the public for recreation purposes.

In order to access the Santiago Creek Dam from the south, take CA-261 N to E Santiago Canyon Road, turn northwest onto E Santiago Canyon Road, and follow it for approximately one mile until Jamboree Road. Head north on Jamboree Road, and turn right on Irvine Park Lane. Continue east on Irvine Park Lane as it turns into Peters Canyon Road, and continue east on Peters Canyon Road until it reaches Santiago Creek Dam.

The primary access road is likely to be inundated during a dam failure. Two other access routes are available which are upstream of the dam and not likely to be inundated:

- Access via Santiago Landfill: Take CA-261 N to E Santiago Canyon Road. Follow E Santiago Canyon Road southeast for 1 mile, and then turn north into the Santiago Landfill. Follow landfill access road north to a location near the spillway.
- Dirt road access via Black Star Canyon: Take CA-261 N to E Santiago Canyon Road. Follow E Santiago Canyon Road southeast for 5.5 miles. Turn left (north) onto Silverado Canyon Rd, then turn left (north) on Black Star Canyon Rd. Drive 1.3 miles north on Black Star Canyon Road to the county access gate. Follow the dirt road north to an intersection with a private dirt road (Latitude 33.772555, Longitude -117.681335). Follow the dirt road west along a winding route until reaching an intersection with another dirt road (Latitude 33.787783, Longitude -117.718690). Turn left (south) and follow the dirt road to the dam and dam keeper residence.

## **7.4 Response During Periods of Darkness**

Because of the availability of 24-hour emergency response staff, the response to an emergency incident during periods of darkness should not be significantly longer than during periods of daylight. Notification times would be within 60 minutes, the same as during daylight hours. Phone numbers in the notification charts are 24-hour contact numbers, so notification procedures during periods of darkness are the same as on weekdays. IRWD maintains a 24-hour emergency response staff to respond to various utility outages and emergency maintenance requirements. Any dam safety incident that requires response actions during periods of darkness may require additional lighting such as portable floodlights. IRWD maintenance and construction personnel can have rental lighting moved to the site in order to respond during times of darkness. Rental lighting equipment is located within 25 miles of the dam and could be moved to the dam site within 2 hours. Additional lighting may also be required by the dam operator in order to perform visual surveillance of a potential or developing situation. Additional lighting options are also available through the IRWD purchasing and contracting department from locally available sources.

## **7.5 Response During Weekends and Holidays**

The dam keeper is generally on site during weekends and holidays, and IRWD/SWD staff are available for recall during emergencies. For slowly developing situations, staff may be recalled and a 24-hour operations center may be established in order to have resources readily available should the situation deteriorate. A rapidly developing situation occurring after hours or during weekends and holidays may require the recall of engineering, maintenance, or other response personnel, and response may be delayed during the recall and mobilization of the IRWD/SWD staff. During weekends and holidays, IRWD/SWD staff could be onsite to assess a rapidly-developing emergency within 60 minutes. This means that the daytime response time of 60 minutes could be extended by 60 minutes, for a weekend/holiday response time of about 2 hours.

## **7.6 Response During Adverse Weather**

Periods of adverse weather that have the ability to impact dam safety may require additional staff to be on-call or prepared to execute response actions. The Director of Water Operations, in collaboration with the dam operator will make staffing recommendations to IRWD and SWD leadership during times of predicted adverse weather. Response time to an emergency situation may be lengthened by 30 minutes during periods of adverse weather. See information in Section 7.3 on site access and alternative points of access. Some of the access points to the dam are dirt roads, which, during adverse weather, may require four-wheel drive or high clearance vehicles.

## **7.7 Alternative Sources of Power**

At Santiago Creek Dam, the aeration system requires power to operate and does not have backup power. However, essential reservoir operations such as control valves and structures do not require power and may be operated manually. Additional generators may be brought to the site to power lighting if needed to evaluate the dam in periods of darkness. Generators are located at the

MWRP at 3512 Michelson Drive, Irvine, California, 92612, located about 13 miles southwest of Santiago Creek Dam. Generators may be brought to the dam site within 60 minutes.

In the event of an electrical outage, cellular phones may be used for communications in lieu of a telephone land line or computer.

## 7.8 Emergency Supplies and Information

IRWD maintains emergency supplies and response equipment for many potential response actions. IRWD's supplies are centrally located at the MWRP at 3512 Michelson Drive, Irvine, California, 92612, located about 13 miles southwest of Santiago Creek Dam. IRWD emergency supplies are listed in Section 7.9. In the event that the IRWD internal response capabilities are exceeded *Table 7-1- Locally Available Resources* is provided to aid in securing additional response materials and equipment. The suppliers listed in Table 7-1 are typically open from 7am-5pm Monday through Friday; outside these hours, a dispatcher is typically available to handle after-hours requests. Secondary phone numbers have been listed where available.

**Table 7-1 Locally Available Resources**

	<b>Heavy Equipment Service and Rental</b>	<b>Sand and Gravel Supply</b>	<b>Ready-Mix Concrete Supply</b>
Company	Herc Rentals	PTI Sand and Gravel	National Ready Mix Concrete
Address	3040 E Miraloma Ave Anaheim, CA 92806	14925 River Rd Corona, CA 92676	16282 Construction Dr Ctr Irvine, CA 92606
Phone Numbers		*	
Contact Person	Jordan Terrio	Mark Tyo	Mike Savicky

\*Daytime and after-hours number: calling the main number after hours will route to an on-call employee.

## 7.9 Stockpiling Materials and Equipment

No equipment is stockpiled at Santiago Creek Dam. Because IRWD owns several dams, as well as other water facilities, IRWD centralizes its emergency supplies stockpile at the MWRP at 3512 Michelson Drive, Irvine, California, 92612, located about 13 miles southwest of Santiago Creek Dam. Supplies and equipment stockpiled centrally at MWRP are ready for deployment for use anywhere within the District's boundary. Equipment and supplies stored at MWRP include generators; diesel fuel; construction equipment such as backhoes and excavators; vacuum trucks; compressors; tools; traffic control equipment; non-woven filter fabric; and excavation and backfill materials including sand, crushed rock, pea gravel, and road base material. Equipment at MWRP can generally be moved to the dam site within 60 minutes. Equipment, materials, and supplies required that exceed the IRWD capabilities are locally accessible at the locations in *Table 7-1 Locally Available Resources*. Equipment obtained from third parties listed in Table 7-1 could be obtained within about 2 hours during regular business hours.

## 7.10 Coordination of Information

In the event of an emergency at Santiago Creek Dam, IRWD will notify the NWS so that they can issue appropriate flood watches and warnings. Contact numbers and notification procedures for NWS are outlined in Sections 3.1 and 3.2

The Santiago Creek Dam stores natural flows collected from the surrounding watershed. The water level in the reservoir is controlled through outlet valves, and if a potential or developing dam safety incident requires the lowering of the reservoir level, this must be done in accordance with the standard operating procedures maintained by IRWD. All actions associated with controlling flow into or out of the reservoir must be coordinated with the dam operator or a representative designated by IRWD.

There are no jurisdictional dams upstream of Santiago Creek Dam. Villa Park Dam is a jurisdictional dam located downstream of Santiago Creek Dam, and may be affected by an emergency event at Santiago Creek Dam. Therefore coordination is required with OCPW, the owner of Villa Park Dam. If the EAP is activated, IRWD will notify OCPW per the notification charts in section 3.1 (call to OCPW Operations and Maintenance Emergency Coordinator). IRWD will explain the current status of the dam and any expected high flows, to allow for OCPW staff to adjust operations at Villa Park Dam, if necessary. IRWD will provide updates to OCPW staff if flows or conditions at the Santiago Creek Dam change or worsen.

IRWD will work with the Unified Command and emergency personnel to keep them up to date on any situation involving the Santiago Creek Dam. The Water Operations Manager may designate staff members to act as liaisons at the ICP, a Unified Command, or at the County and OA EOC.

## 7.11 Training and Exercise

IRWD/SWD operations and maintenance staff receive training to ensure that they are thoroughly familiar with the elements of the EAP and potential response actions. The operations, engineering staff, and appropriate personnel are trained in the incident management process, including detection, evaluation, notification, and appropriate response actions during all emergency level determinations. IRWD/SWD duty staff are trained in notification requirements for dam safety incidents to ensure that the appropriate recall actions are initiated after working hours.

In accordance with California Government Code Section 8589.5(c), at least once annually, IRWD will conduct an emergency action plan notification exercise with local public safety agencies, to the extent that a local public safety agency wishes to participate. This annual exercise is to ensure that emergency communications plans and processes are current and implemented effectively. All contact information in the notification charts will be updated and verified; next, a notification exercise will be conducted to simulate the phone calls required in the notification charts. The timing and procedures in the notification exercise will be noted, and the EAP will be updated based on feedback from the participants.

Because the Santiago Creek Dam is categorized as an Extremely High-risk dam, local emergency management authorities may develop evacuation and shelter-in-place training materials for people who would be affected by a dam failure in their jurisdiction. These requirements and materials will be determined and developed through the review and exercise process described in Section 7.2.

## **7.12 Alternative Systems of Communication**

In the event of a dam safety emergency, the Unified Command and emergency response personnel have access to various forms of alternative communication ranging from social media, radio broadcasts, wireless emergency alerts, and opt-in email and cellphone lists. OCSO Control One is the central point of contact for interoperable communications between all law enforcement, fire, and public works agencies. Control One can broadcast an emergency message to all dispatcher centers at once via radio, and can send messages via teletype over communications terminals.

IRWD maintains an operations communication architecture for internal communications. Communication at the dam is facilitated by the on-site dam keeper. The dam keeper is able to use a cellular phone, land line telephone, or a computer connected to the internet to communicate with other IRWD personnel and emergency response personnel.

## **7.13 Public Awareness and Communication**

IRWD will lead the public awareness on behalf of IRWD and SWD. IRWD will utilize already established communication protocols and channels to publish and promote established inter-agency emergency procedures within the affected area. In addition, information on the location of the reservoir as well as related emergency procedures will be available on the IRWD website (<https://www.irwd.com/>).

In order to further prepare the public for a dam safety incident IRWD will implement the following measures:

- Educate customers about established IRWD emergency notification systems, which include the ability to text, call or email customers in the event of an emergency such as a dam safety incident.
- Promote the emergency preparedness section on the IRWD website and through various communications channels including the monthly customers billing insert and social media channels.
- Coordinate emergency outreach programs with residents and businesses in close proximity to the reservoir through cities, fire and police departments and the County of Orange.
- Post a map of the inundation area on the IRWD website so that members of the public may see if they live within possible impacted areas.
- Post a summary of the annual EAP exercise on the IRWD website each year.

- 
- Update existing information on dam safety and emergency-preparedness on the IRWD website within one month of the approval of the EAP. After each annual review, updates will be made to the website as necessary.
  - Complete outreach to customers through existing outreach channels within 4 months of completion of the EAP.

The timing and frequency of additional outreach measures will be evaluated and updated as part of the annual EAP review.

---

# Section 8: Plan Maintenance

---

## 8.1 Plan Review and Maintenance

The EAP Coordinator will review and update the EAP at least once annually leading up to the emergency action plan notification exercise described below. This review includes updating contact information listed to verify that contact names, phone numbers, addresses and other information is current. One of the most important tasks is to update the contacts listed in the Emergency Notification Flowcharts in Section 3. Making updates to locally available resources along with the other information in the EAP is also important so that accurate information is readily available during an emergency.

In accordance with California Government Code Section 8589.5(c), at least once annually, IRWD will conduct an emergency action plan notification exercise with local public safety agencies, to the extent that a local public safety agency wishes to participate. This annual exercise is to ensure that emergency communications plans and processes are current and implemented effectively.

In accordance with California Water Code section 6161(e), IRWD will update the EAP, including the inundation maps, no less frequently than every 10 years, and sooner under conditions that include: (1) a significant modification to the dam or a critical appurtenant structure and (2) a significant change to downstream development that involves people and property. The inundation maps for this EAP are dated January 26, 2018, and requires updating by January 26, 2028.

## 8.2 Distribution

A status report will be prepared annually that documents the plan review and any exercises that occurred. The EAP will be revised, as required, to incorporate updated information or lessons learned during exercises/event after action reports. Changes will be documented in the revision log in Appendix B, Record of EAP Revisions.

Electronic copies of the EAP Status Report (Appendix A) and revised EAP will be distributed to the EAP Plan Holders annually via email (Appendix C). The EAP Plan Holders include all parties on the notification flowcharts.

To request a copy of the Emergency Action Plan for Santiago Creek Dam, please contact the EAP Coordinator:

Steve Choi, Director of Safety and Security  
Irvine Ranch Water District

## PART II: Inundation Maps



**DEPARTMENT OF WATER RESOURCES**

1416 NINTH STREET, P.O. BOX 942836  
SACRAMENTO, CA 94236-0001  
(916) 653-5791



**AUG 20 2019**

Mr. Paul Cook, General Manager  
Irvine Ranch Water District  
Post Office Box 57000  
Irvine, California 92619-7000

Mr. Jerry Vilander, General Manager  
Serrano Water District  
18021 East Lincoln Street  
Villa Park, California 92861-6446

Santiago Creek Dam, No. 75  
Orange County

Dear Mr. Cook and Mr. Vilander:

The Division of Safety of Dams (DSOD) has reviewed the inundation map submitted for Santiago Creek Dam. It was determined that the dam has no critical appurtenant structures and the map listed below is in substantial compliance with the requirements of Title 23, Division 2, Chapter 1, Article 6 of the California Code of Regulations. Therefore, the following inundation map is approved:

1. Main Dam (sunny day failure scenario) map dated January 26, 2018.

The approved map will be made publicly available as required by section 6161(c) of the California Water Code. An emergency action plan (EAP), based on the approved inundation map, must now be submitted to the California Governor's Office of Emergency Services (Cal OES) for their review and approval. Upon Cal OES approval, please submit an electronic copy of the approved EAP with a hard copy of the transmittal letter to DSOD.

Pursuant to section 6161(e) of the CA Water Code, the EAP and inundation map must be updated no less frequently than every 10 years, and sooner under conditions that include, but are not limited to, the following: (1) a significant modification to the dam or a critical appurtenant structure as determined by the department, or (2) a significant change to downstream development that involves people and property. Based on the requirement, the approved maps will expire on January 26, 2028. Please submit the updated map at least six months prior to the expiration date for DSOD's review and approval.

If you have any questions or need additional information, you may contact Design Engineer Dean Smith at (916) 565-7843 or Re-evaluation Engineering Branch Chief Ariya Balakrishnan at (916) 565-7870.

Sincerely,

A handwritten signature in blue ink, appearing to read "Sharon K. Tapia".

Sharon K. Tapia, Chief  
Division of Safety of Dams

cc: (See Attached List)

Mr. Cook and Mr. Vilander

AUG 20 2019  
Page 2

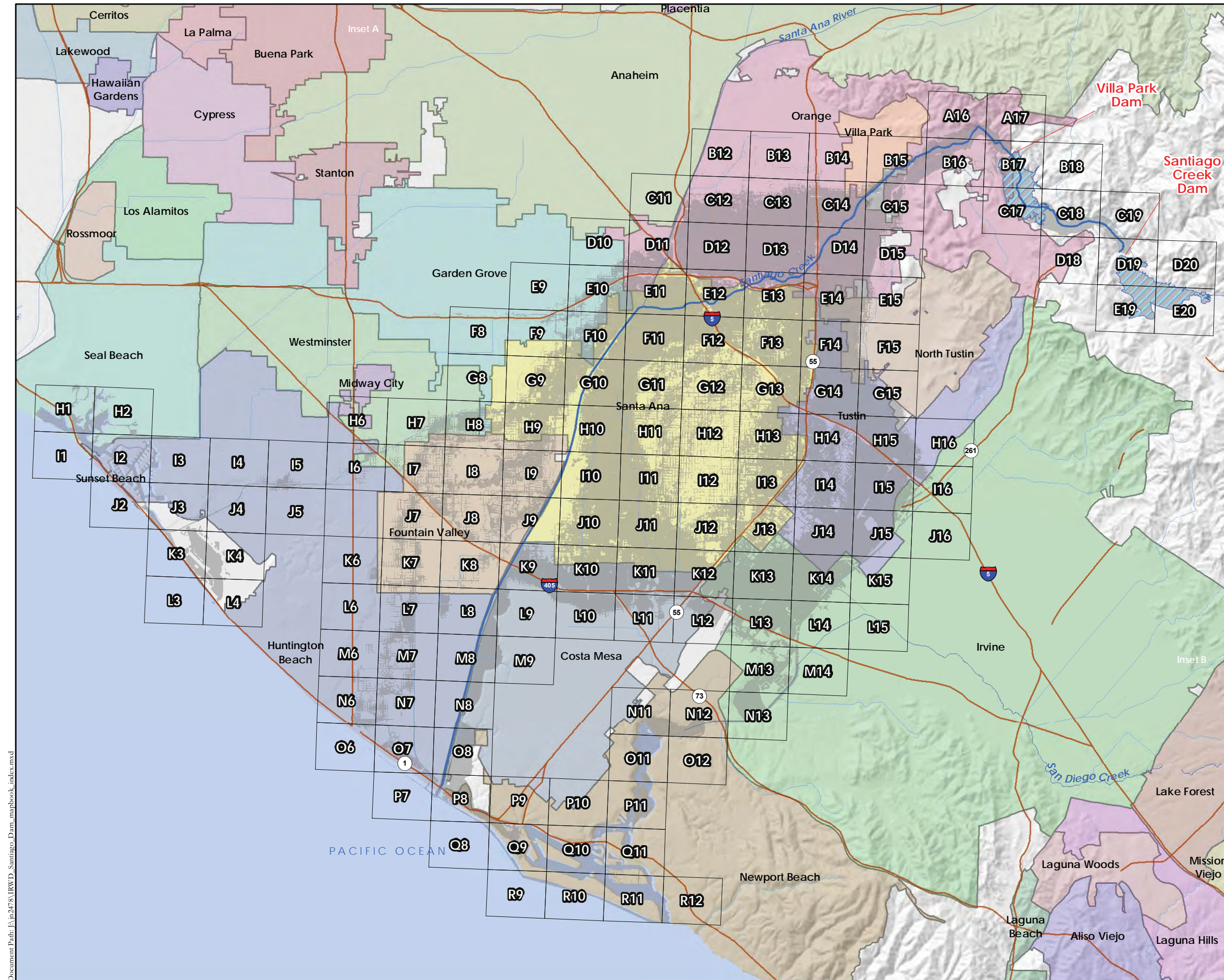
cc: Mr. José Lara, Chief  
Dam Safety Planning Division  
California Governor's Office of Emergency Services  
3650 Schriever Avenue  
Mather, California 95655

**SANTIAGO CREEK DAM  
INUNDATION MAP INDEX**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA

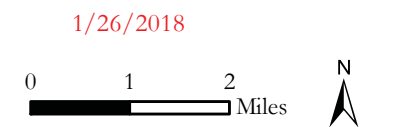


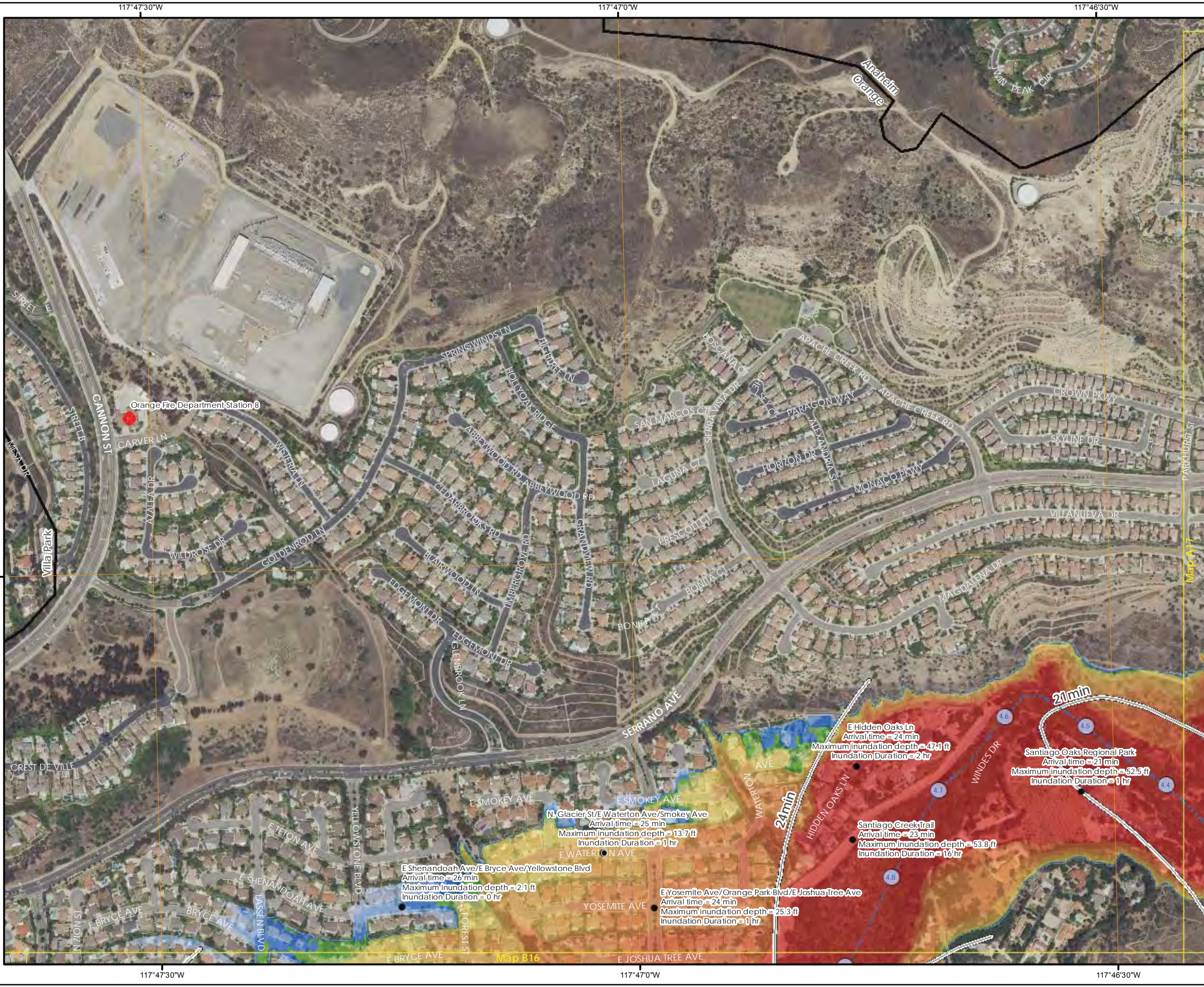
**Legend**

- Map Index Grid
- Stream
- Highway
- Reservoir
- Sunny Day Failure Inundation Area

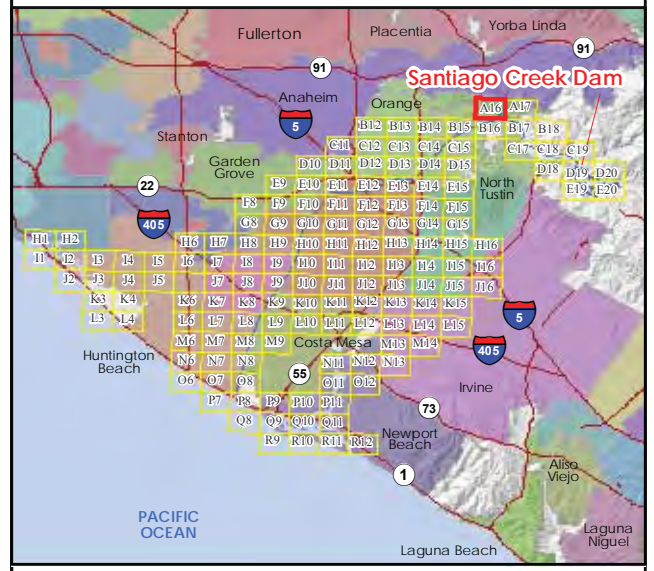


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**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

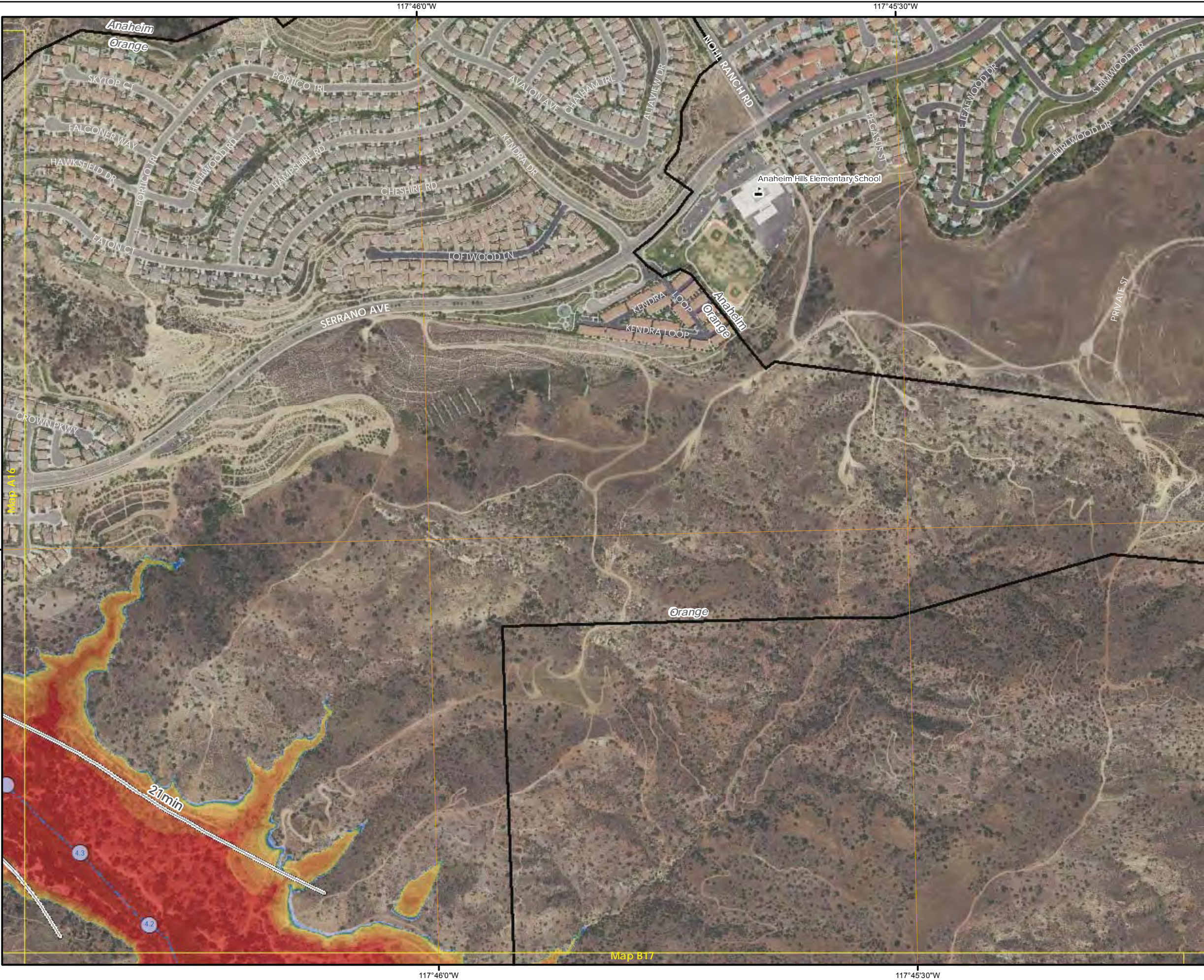


Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

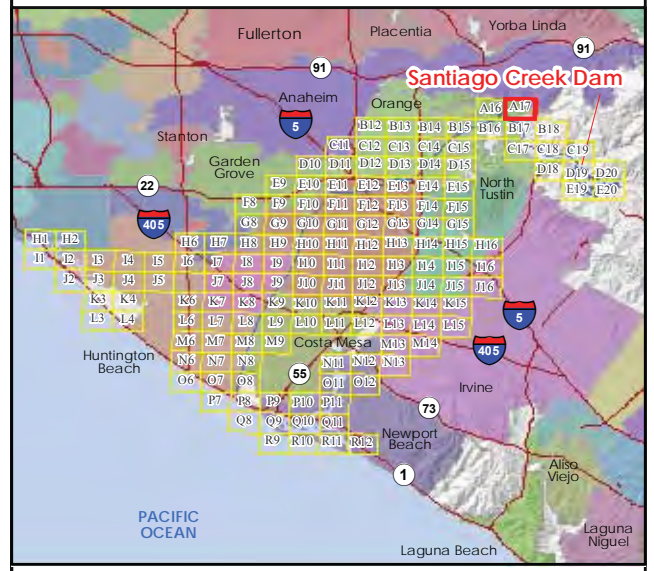
PANEL 1 of 148

**A16**

STETSON ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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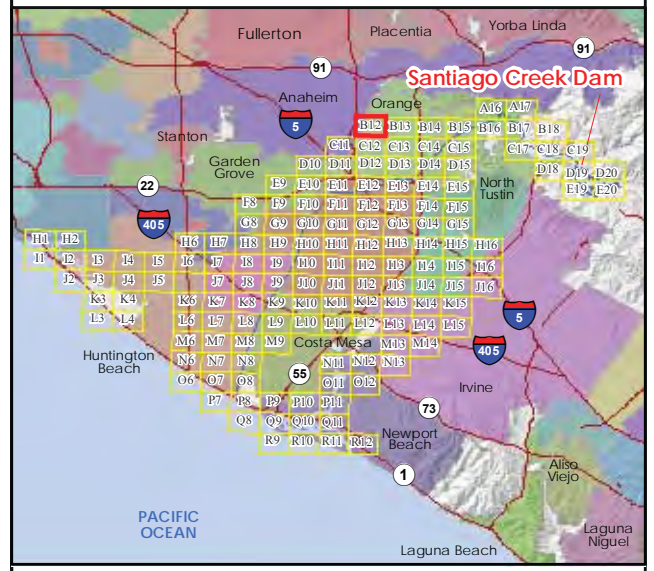
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 2 of 148**

**A17**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile


**Maximum Inundation Depth, Sunny Day Failure**


- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018


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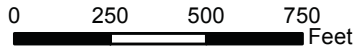
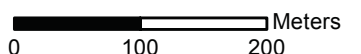
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

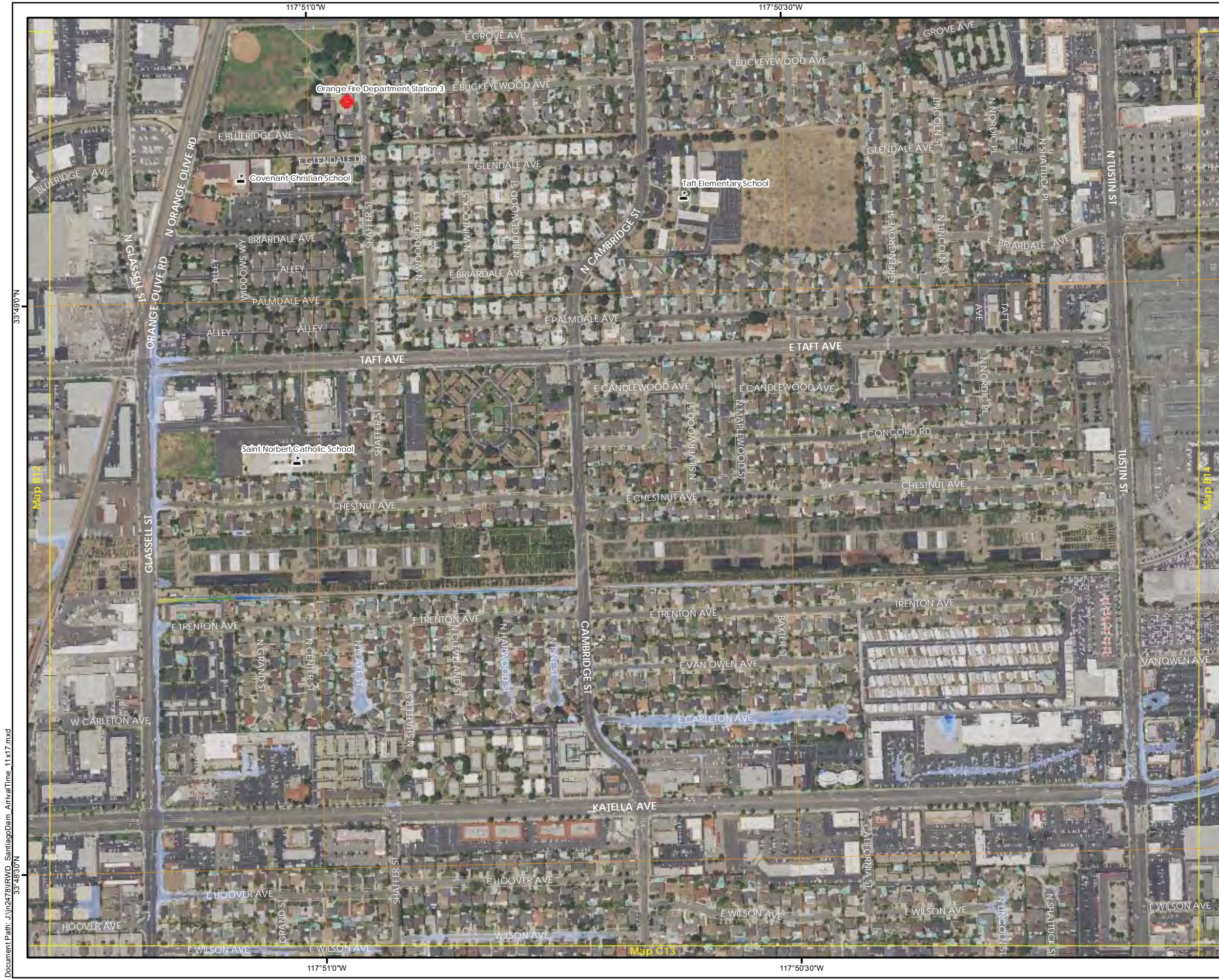
  
**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019



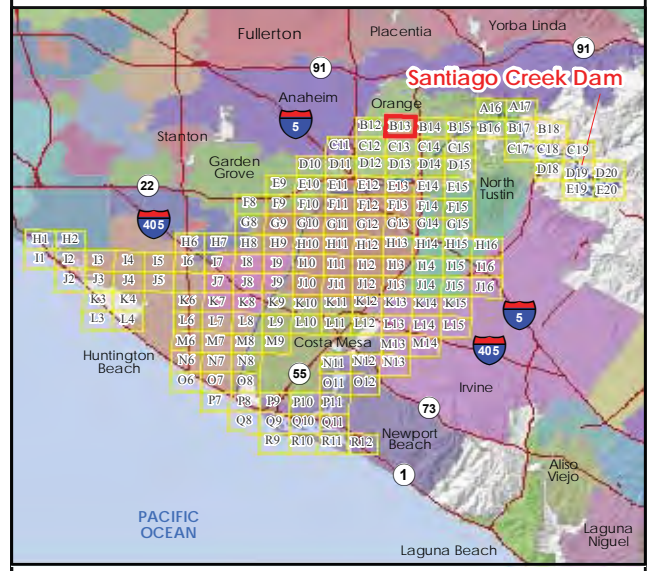
**PANEL 3 of 148** **B12**





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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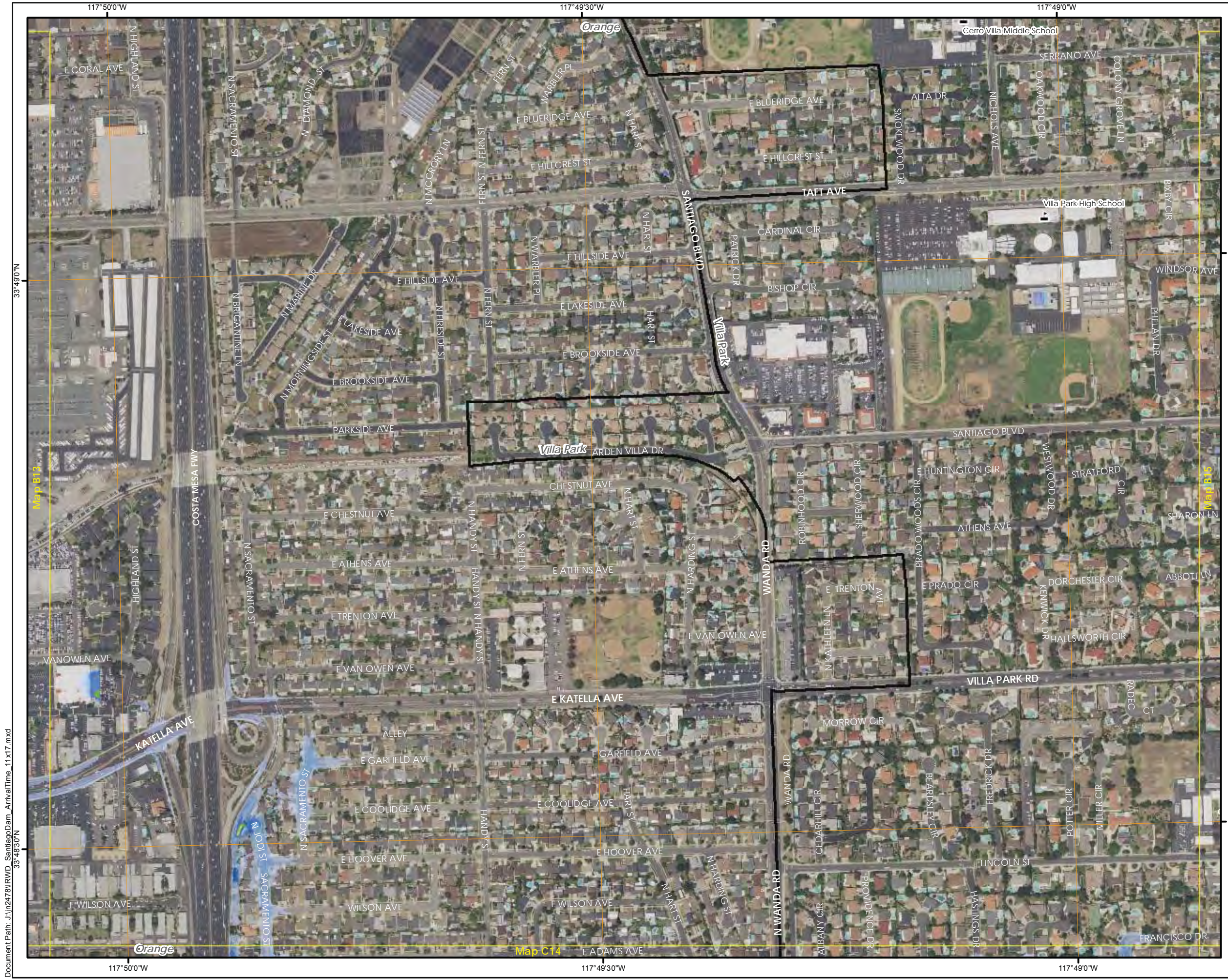
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 4 of 148

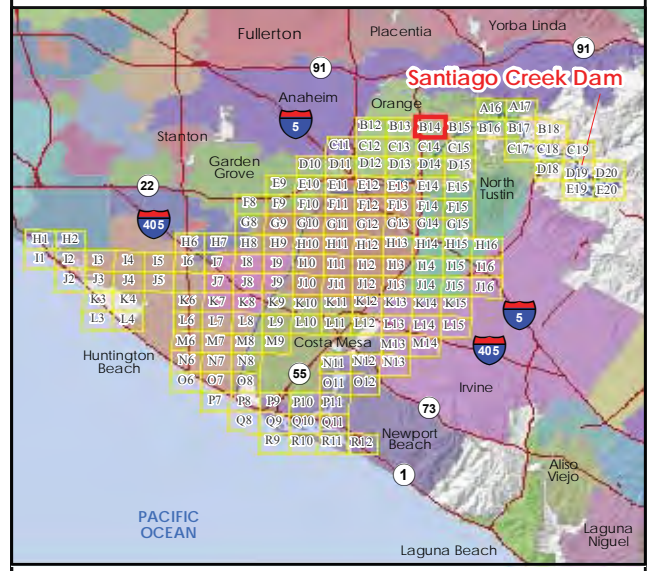
**B13**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

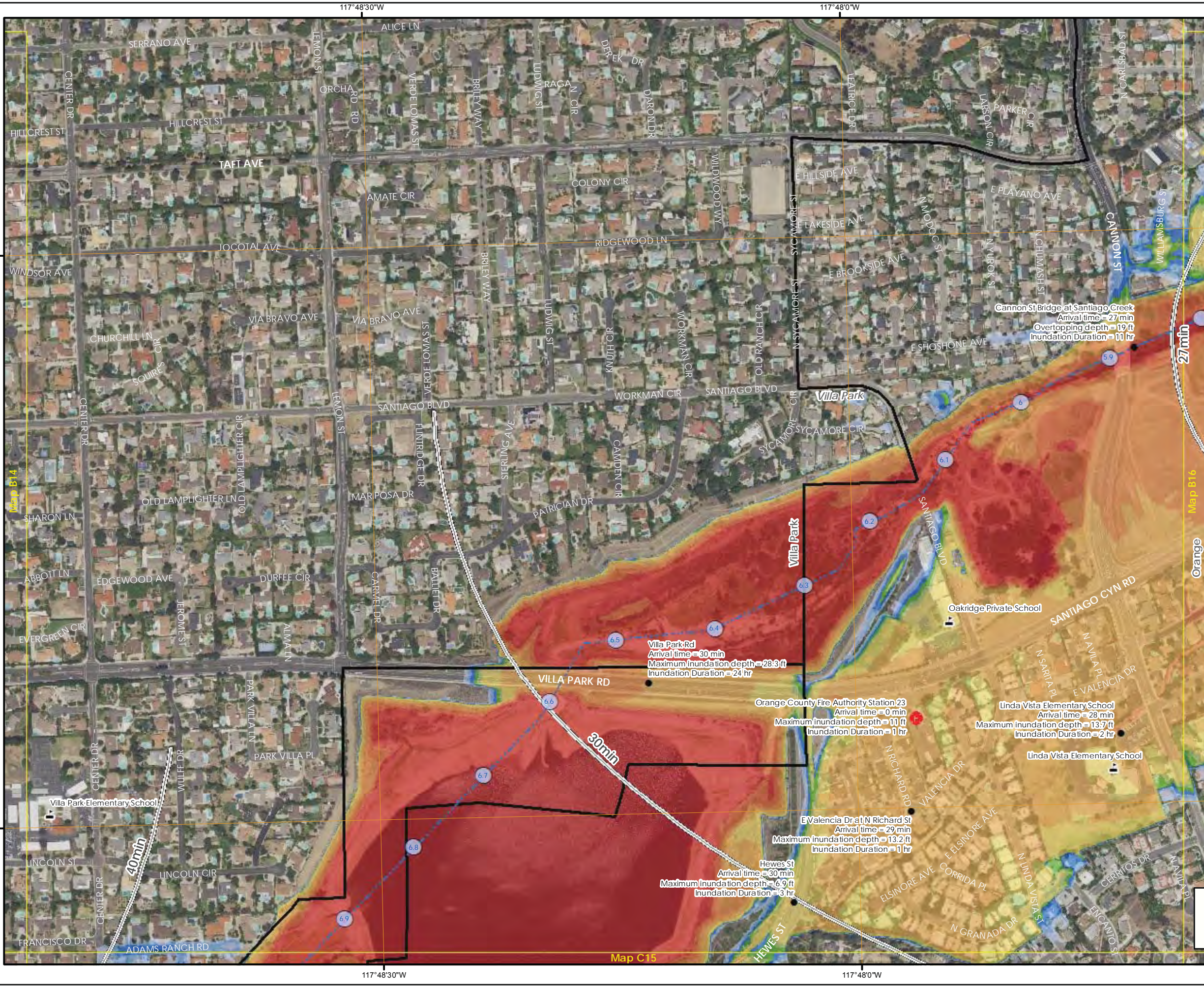
**PANEL 5 of 148**

**B14**

**STETSON ENGINEERS INC.**

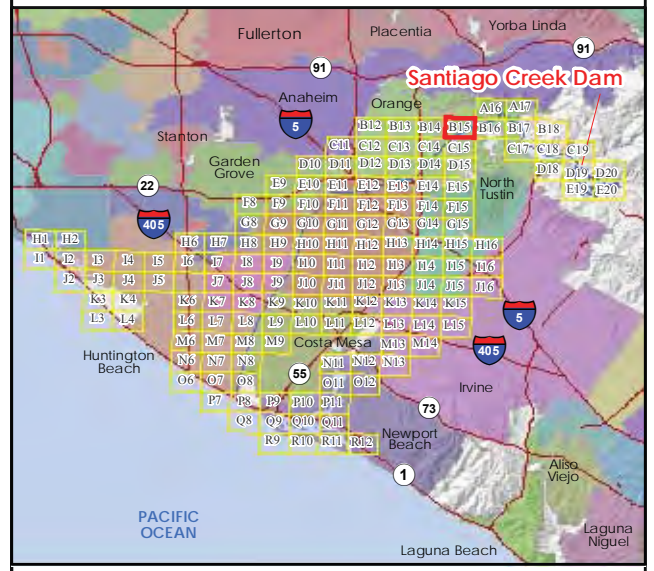


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# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

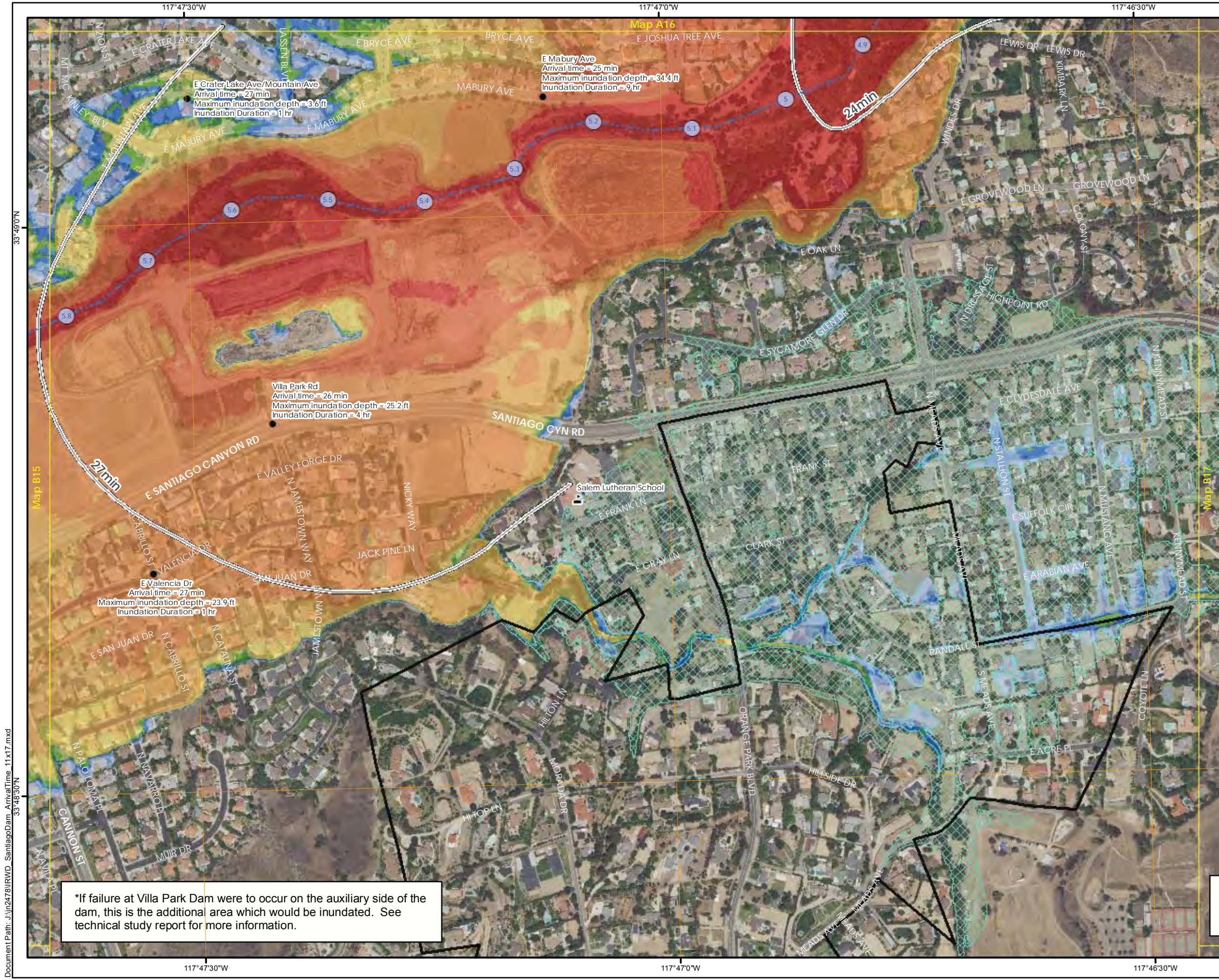
PANEL 6 of 148

**B15**

STETSON ENGINEERS INC.

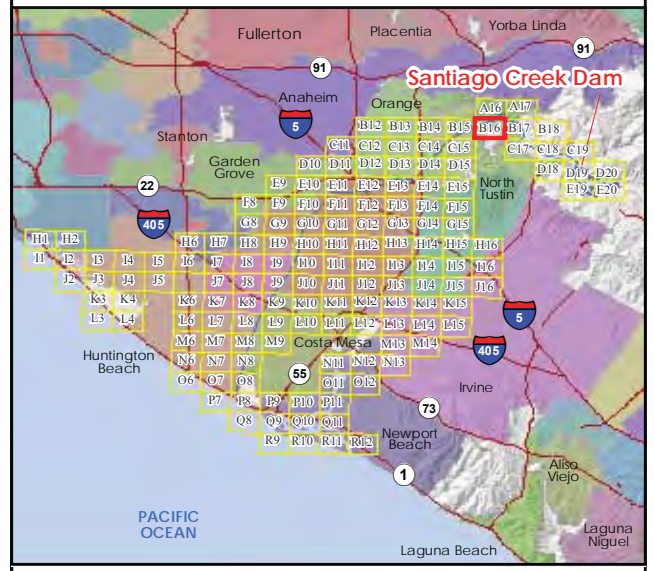
0 250 500 750 Feet

0 100 200 Meters



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- Auxiliary Dam
- Inundation Area\*
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 7 of 148

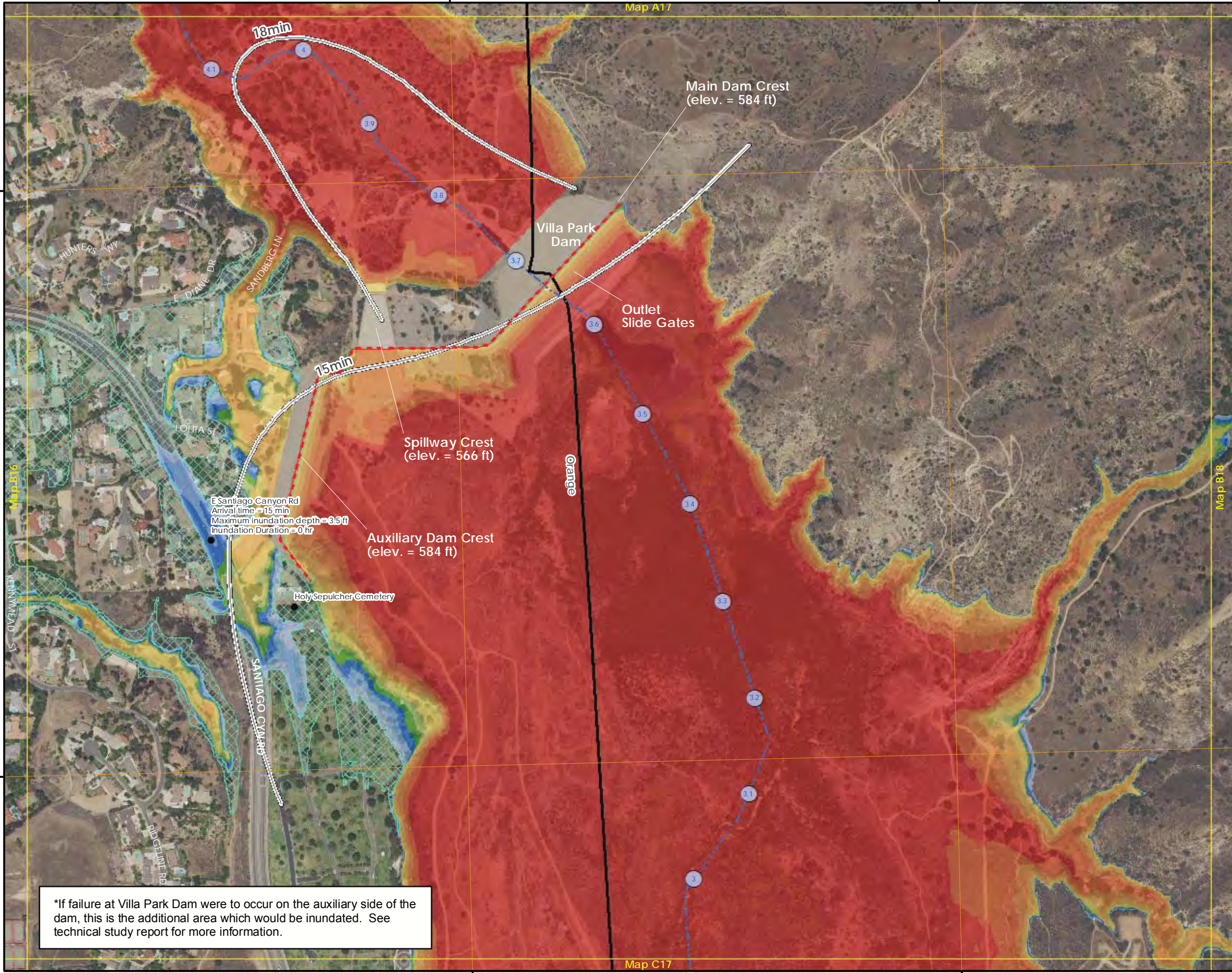
**B16**

0 250 500 750 Feet

0 100 200 Meters

\*If failure at Villa Park Dam were to occur on the auxiliary side of the dam, this is the additional area which would be inundated. See technical study report for more information.

117°46'0"W 117°45'30"W



Map B16

Map B18

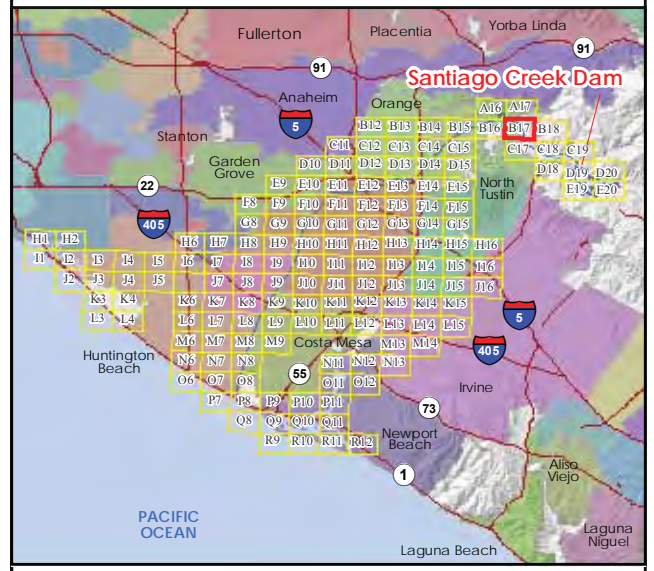
Document Path: J:\m2478\RW\Dam\_SantiagoDam\_ArrivalTime\_11x17.mxd 33°48'30"N

Map C17

117°46'0"W 117°45'30"W

# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



### Legend

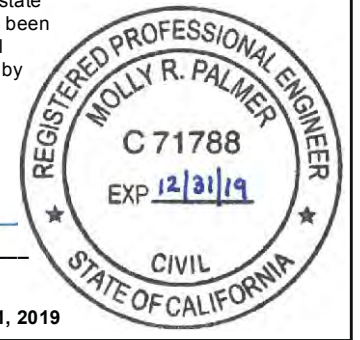
- Map Panel #
  - Dam Crest
  - River
  - Arrival Time
  - Auxiliary Dam
  - Inundation Area\*
  - City Boundary
  - River Mile
- Maximum Inundation Depth,  
Sunny Day Failure
- 0-1 ft
  - 1-2 ft
  - 2-3 ft
  - 3-4 ft
  - 4-5 ft
  - 5-10 ft
  - 10-20 ft
  - 20-30 ft
  - 30-40 ft
  - >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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*Molly Palmer*



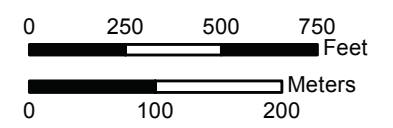
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

\*If failure at Villa Park Dam were to occur on the auxiliary side of the dam, this is the additional area which would be inundated. See technical study report for more information.

PANEL 8 of 148

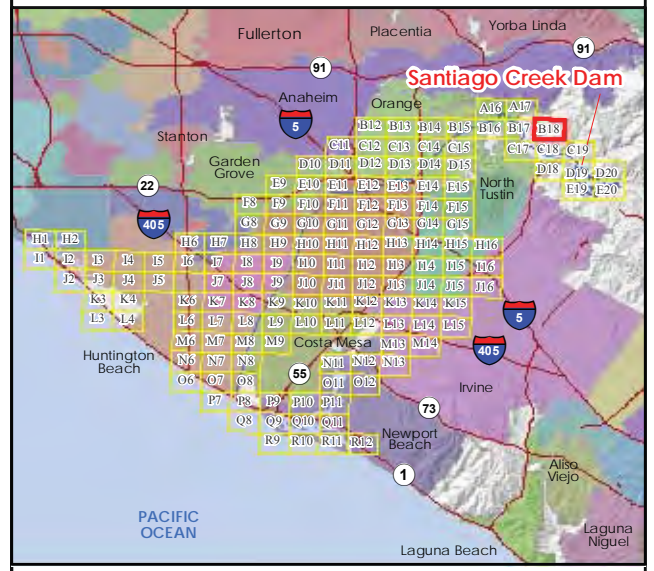


B17





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 9 of 148

**B18**

N

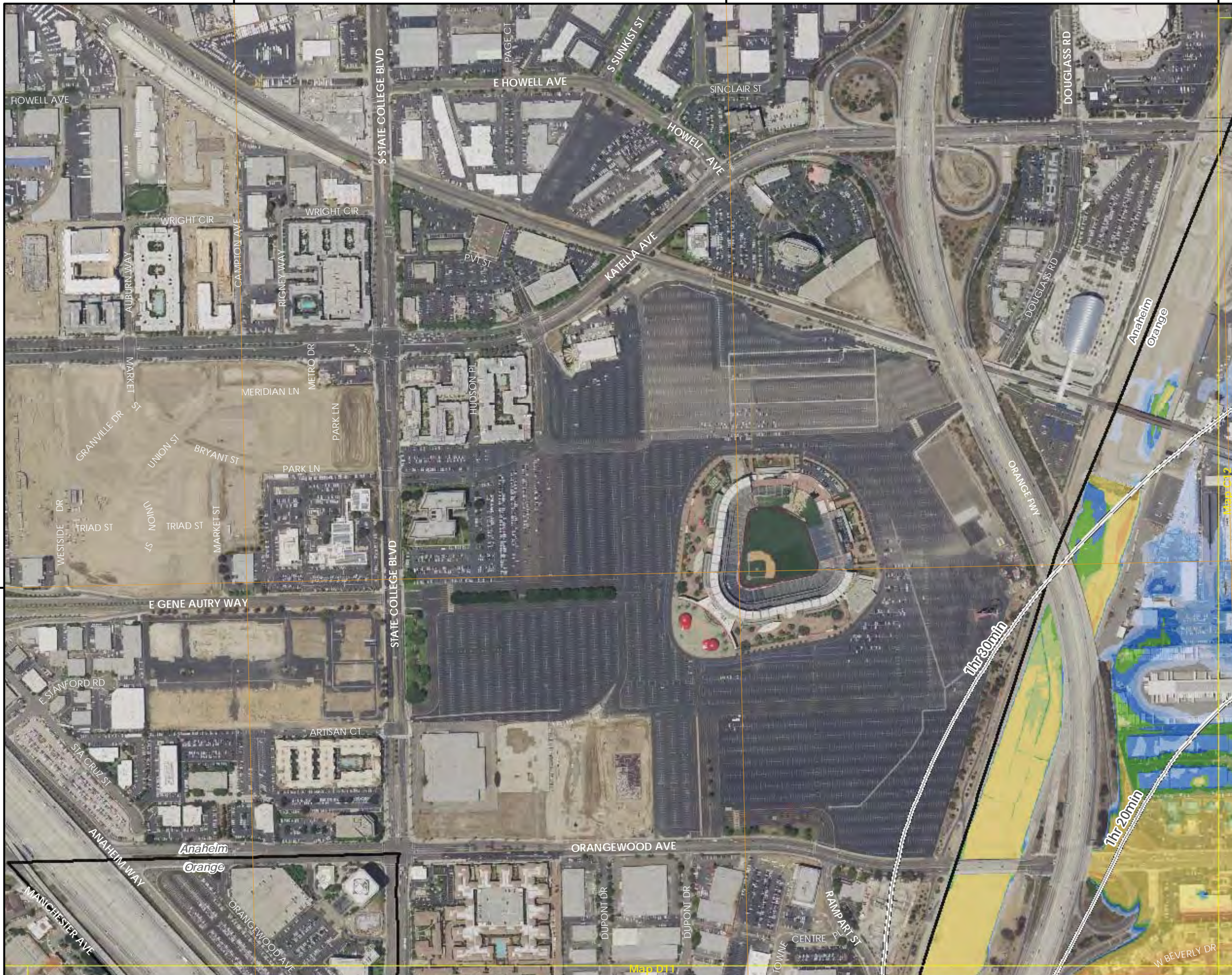
0 250 500 750 Feet

0 100 200 Meters

117°53'30"W

117°53'0"W

117°52'30"W



33°48'0"N

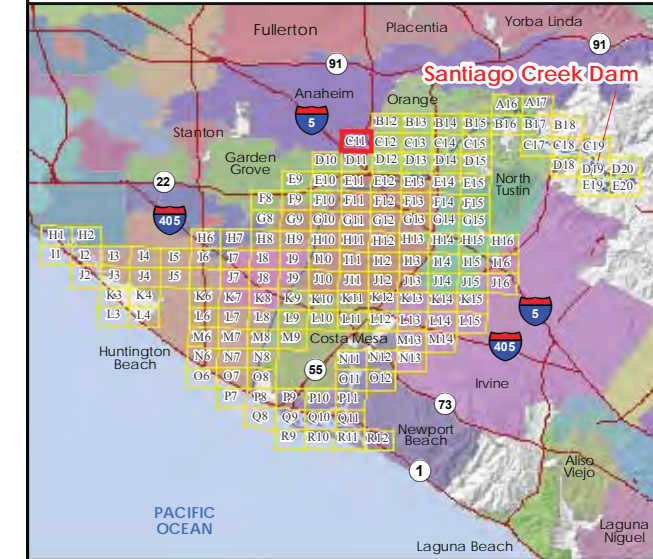
33°48'0"N

117°53'30"W

117°53'0"W

117°52'30"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

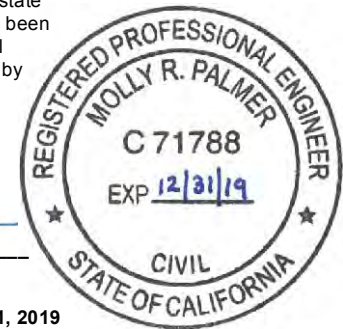
- |               |          |
|---------------|----------|
| Map Panel #   | 0-1 ft   |
| Dam Crest     | 1-2 ft   |
| River         | 2-3 ft   |
| Arrival Time  | 3-4 ft   |
| City Boundary | 4-5 ft   |
| River Mile    | 5-10 ft  |
|               | 10-20 ft |
|               | 20-30 ft |
|               | 30-40 ft |
|               | >40 ft   |

1/26/2018

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*Molly Palmer*

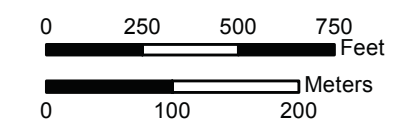


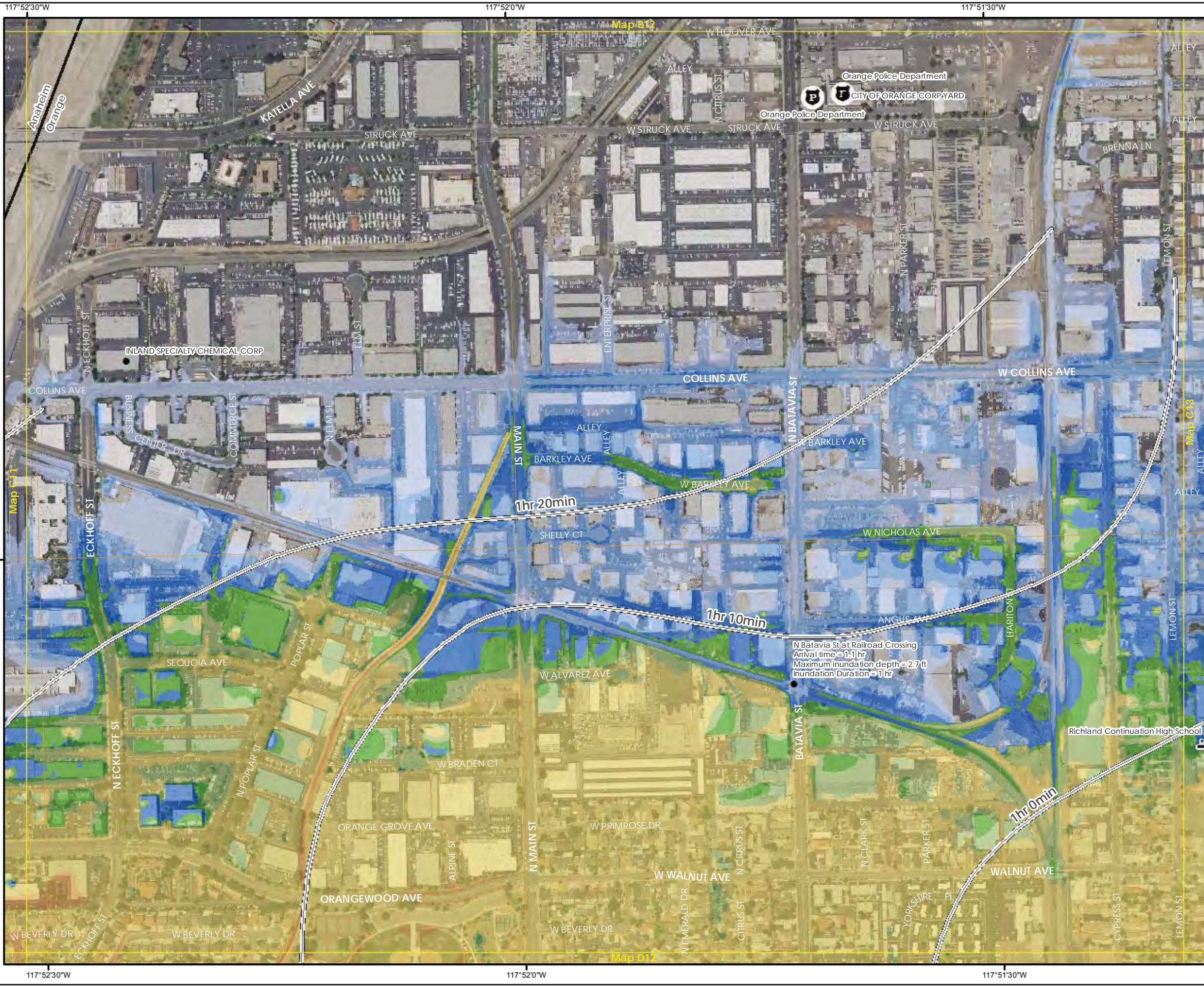
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 10 of 148



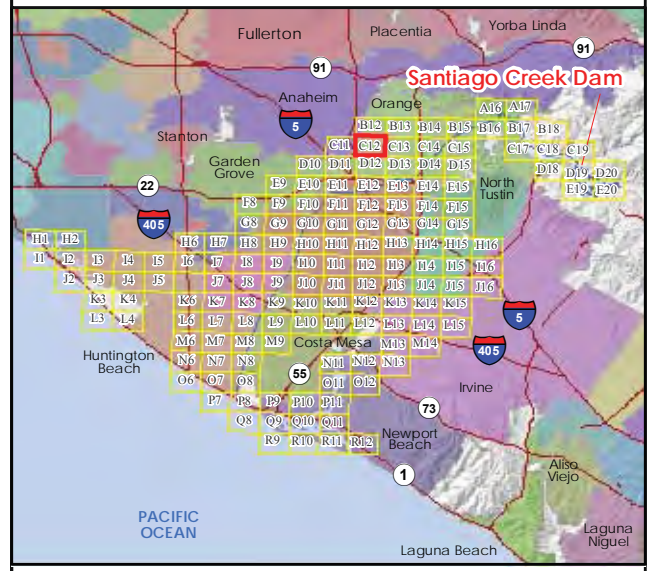
C11





# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- P Police Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

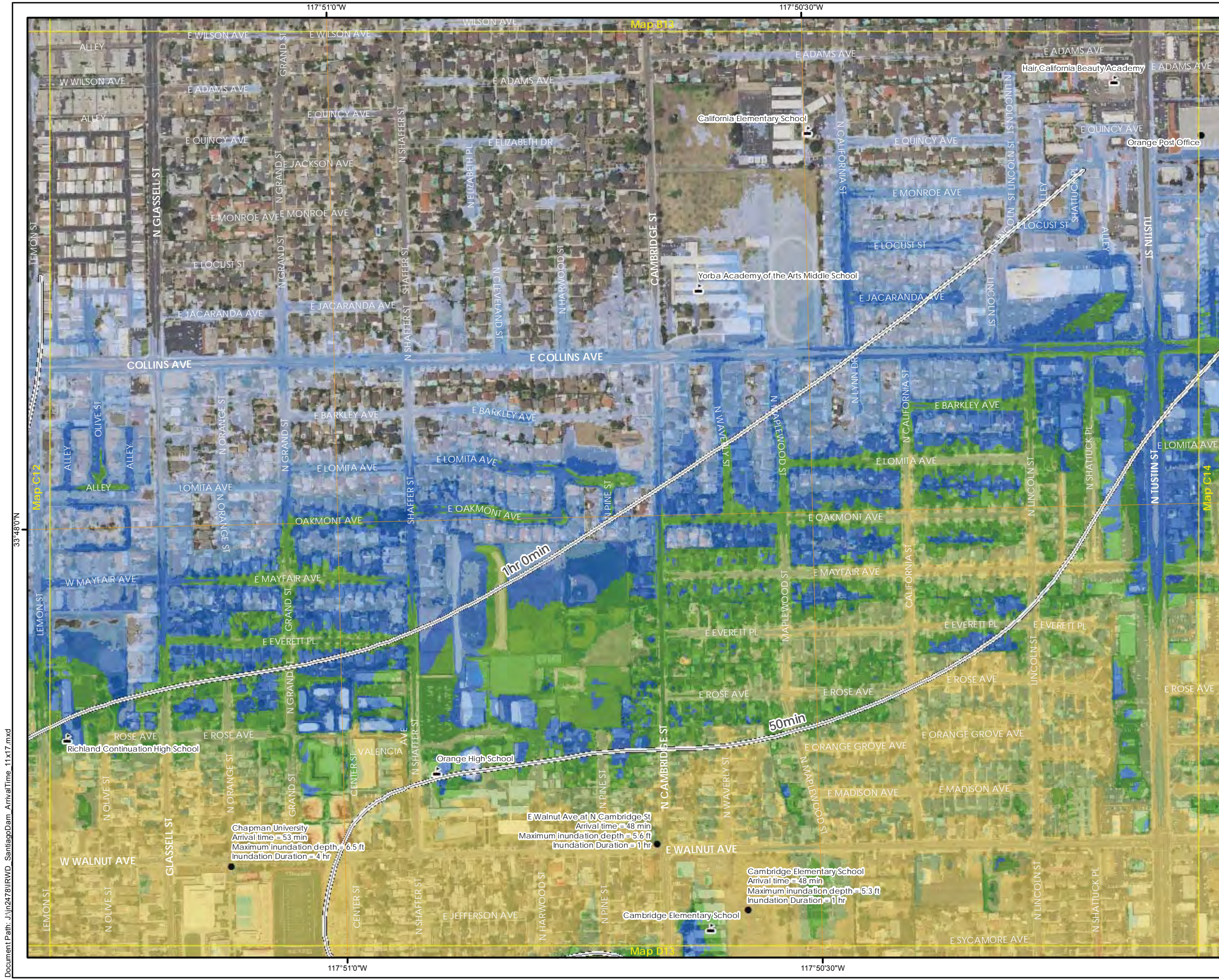
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

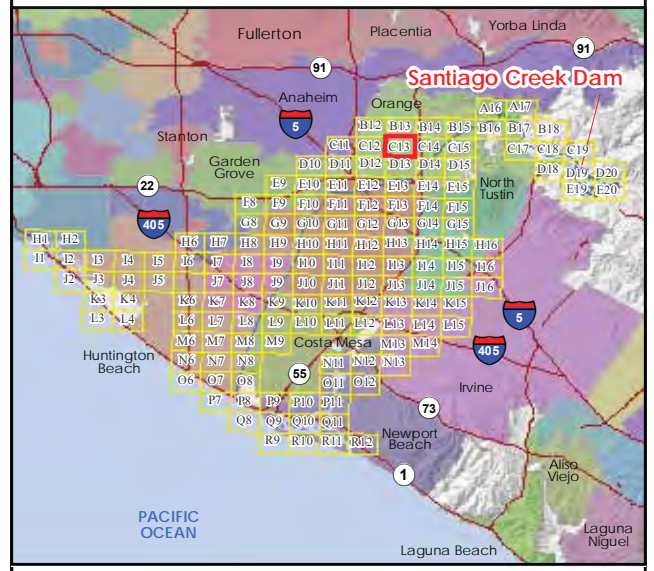
PANEL 11 of 148

**C12**



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

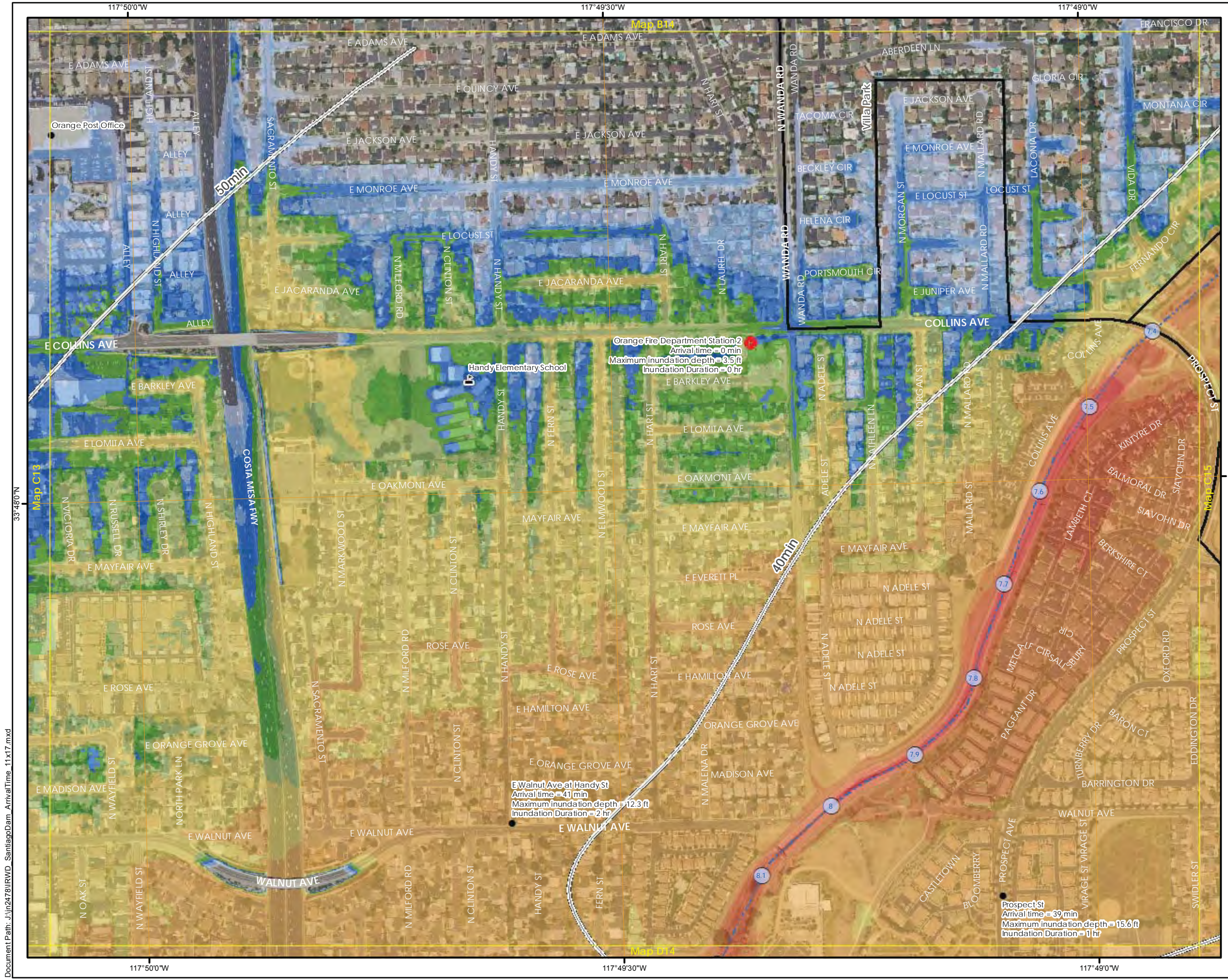
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

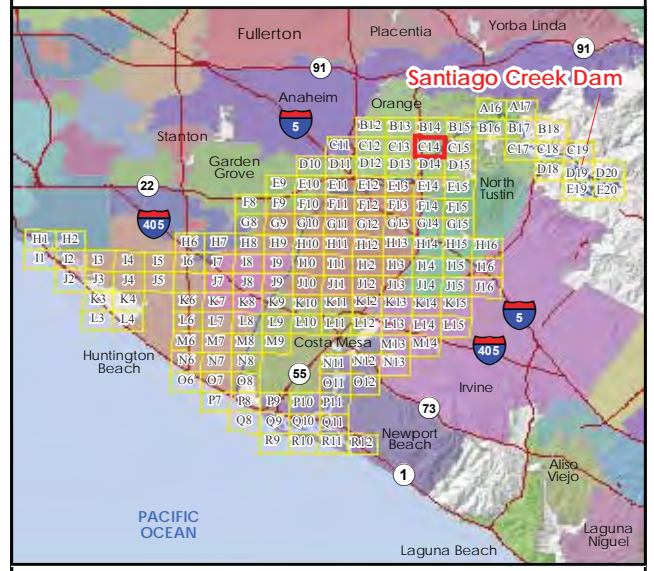
PANEL 12 of 148

**C13**



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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*Molly Palmer*

**REGISTERED PROFESSIONAL ENGINEER**  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

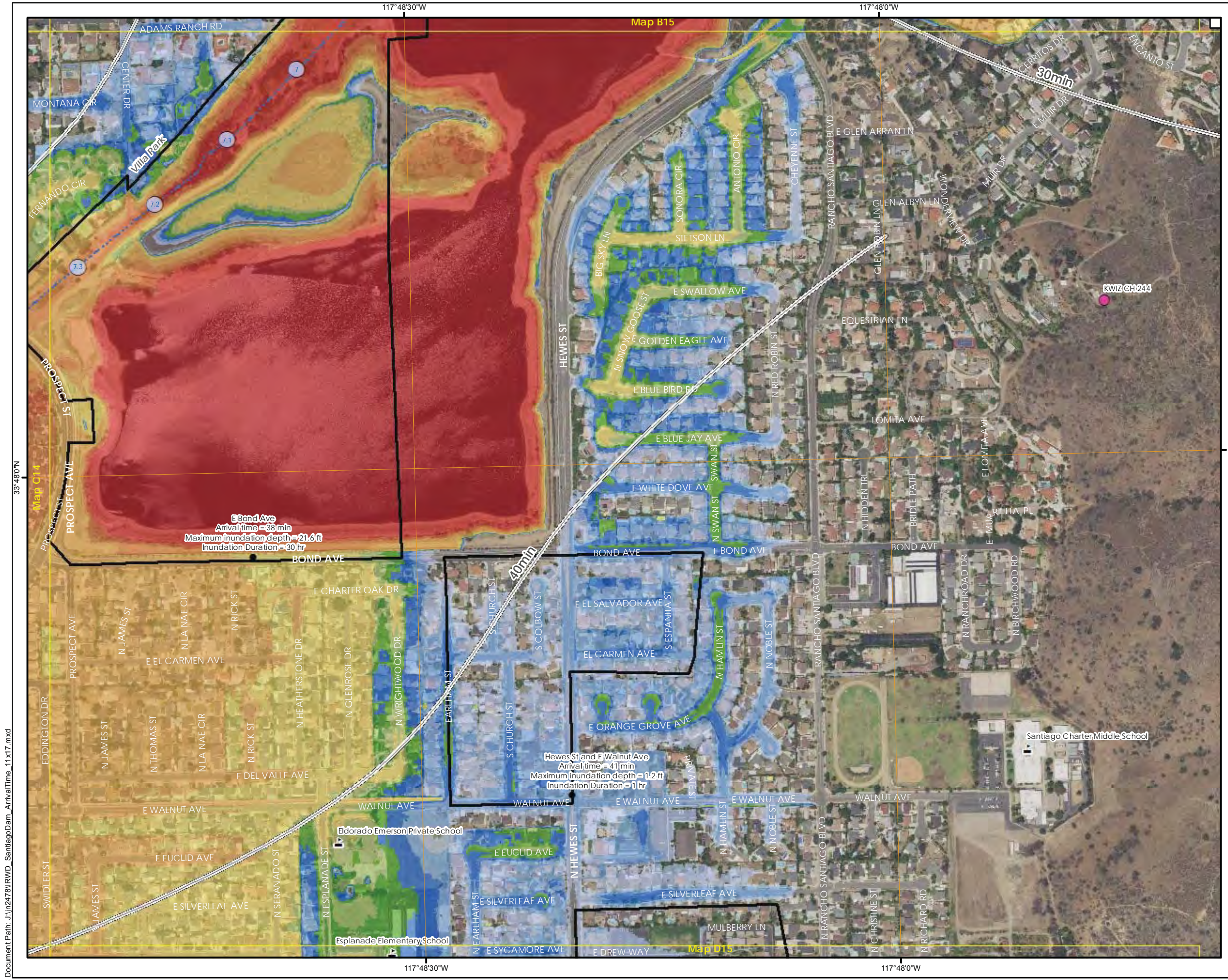
PANEL 13 of 148

**STETSON ENGINEERS INC.**

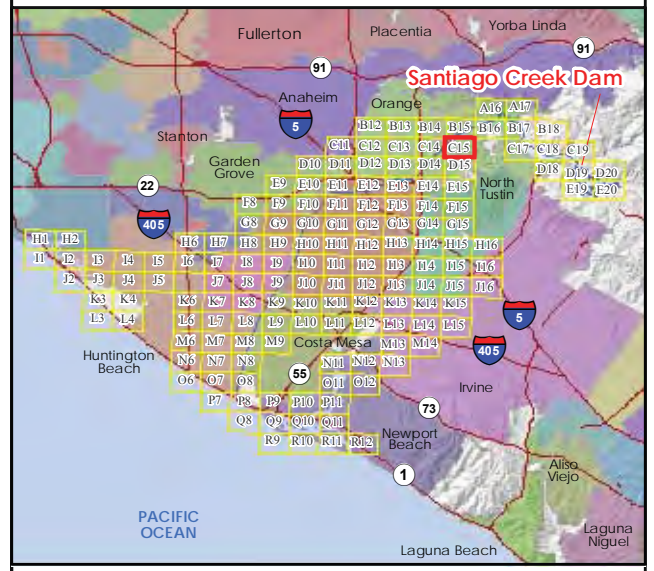
**C14**

0 250 500 750 Feet  
0 100 200 Meters





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Communications Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

**PANEL 14 of 148**

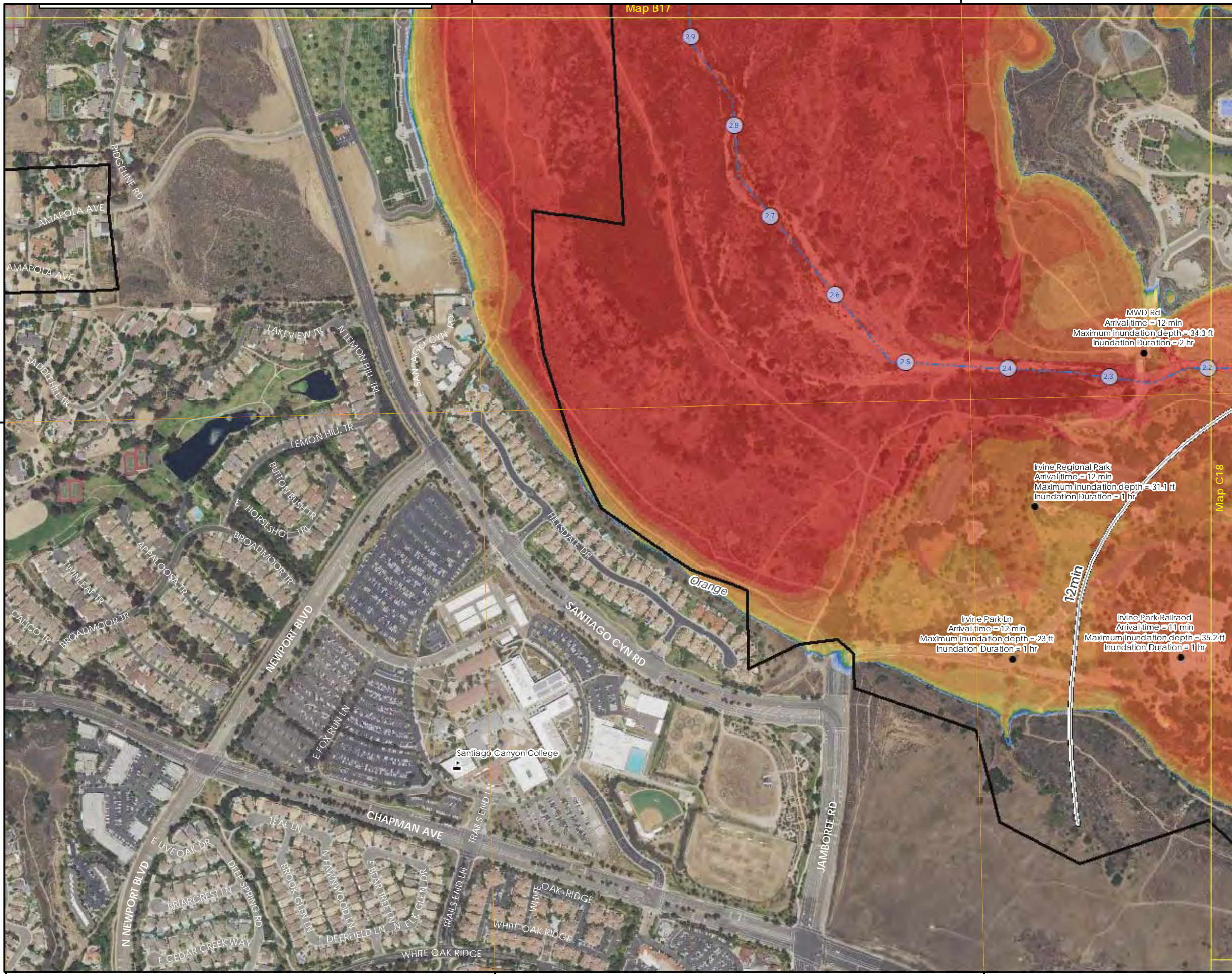
**C15**

STETSON ENGINEERS INC.

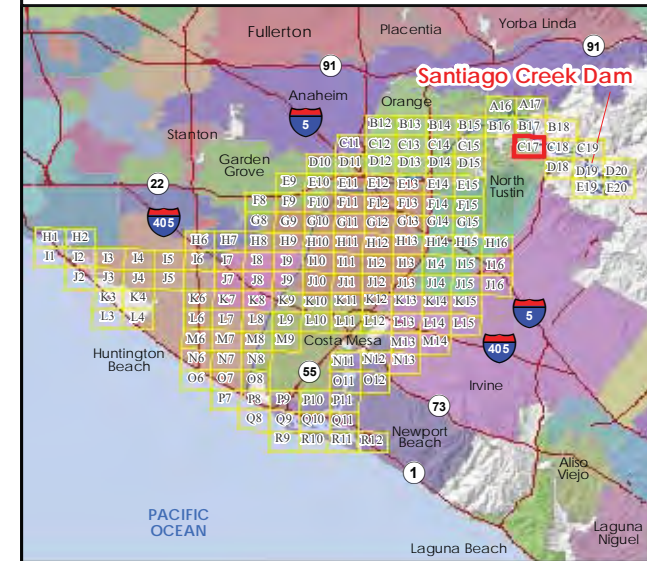
117°46'0"W

117°45'30"W

Map B17



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



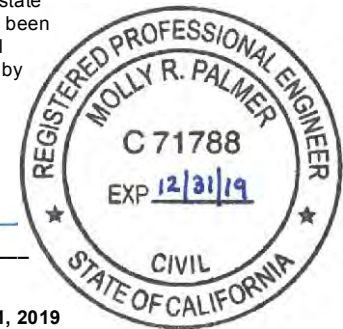
**Legend**

- Map Panel #
  - Dam Crest
  - River
  - Arrival Time
  - City Boundary
  - River Mile
  - School
- Maximum Inundation Depth, Sunny Day Failure**
- 0-1 ft
  - 1-2 ft
  - 2-3 ft
  - 3-4 ft
  - 4-5 ft
  - 5-10 ft
  - 10-20 ft
  - 20-30 ft
  - 30-40 ft
  - >40 ft

1/26/2018

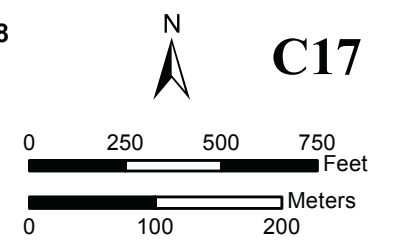
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Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 15 of 148



**C17**

Document Path: J:\m2478\RW\ SantiagoDam\_ArrivalTime\_11x17.mxd

7°46'30"W

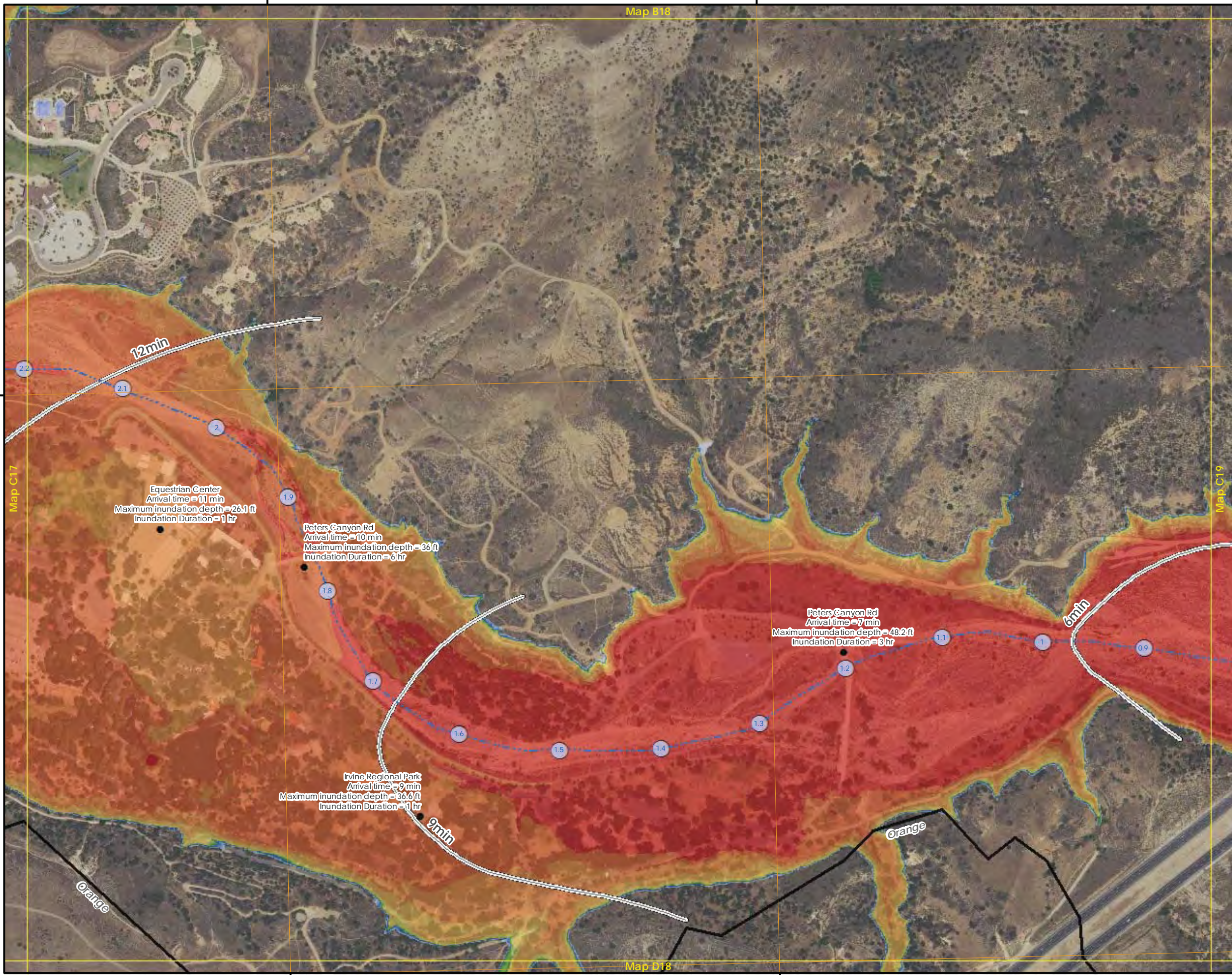
117°46'0"W

117°45'30"W

117°45'0"W

117°44'30"W

Map B18



Map C17

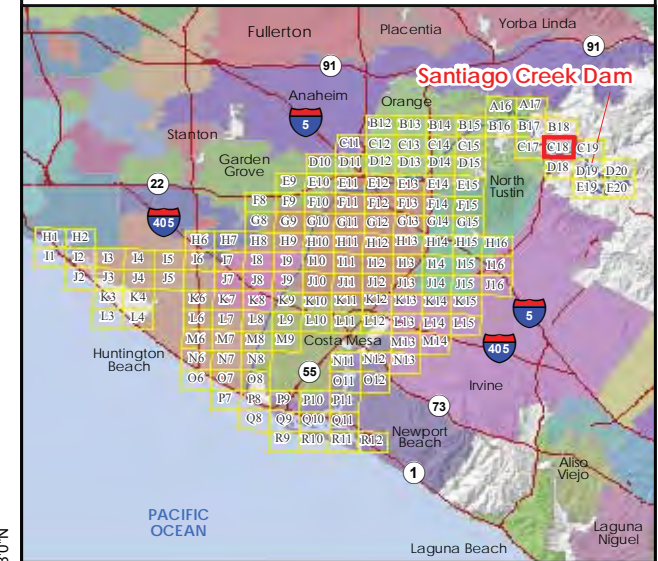
Map C19

Map D18

117°45'0"W

117°44'30"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



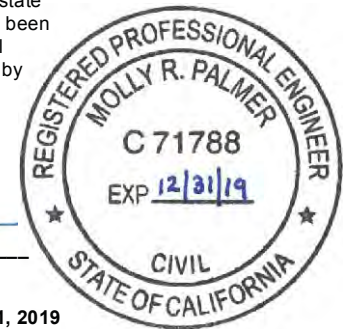
**Legend**

- Map Panel #
  - Dam Crest
  - River
  - Arrival Time
  - City Boundary
  - River Mile
- | Maximum Inundation Depth, Sunny Day Failure |          |
|---|----------|
|   | 0-1 ft   |
|   | 1-2 ft   |
|   | 2-3 ft   |
|   | 3-4 ft   |
|   | 4-5 ft   |
|   | 5-10 ft  |
|   | 10-20 ft |
|   | 20-30 ft |
|   | 30-40 ft |
|   | >40 ft   |

1/26/2018

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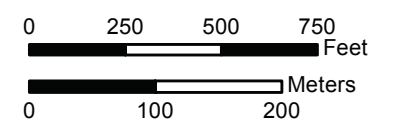


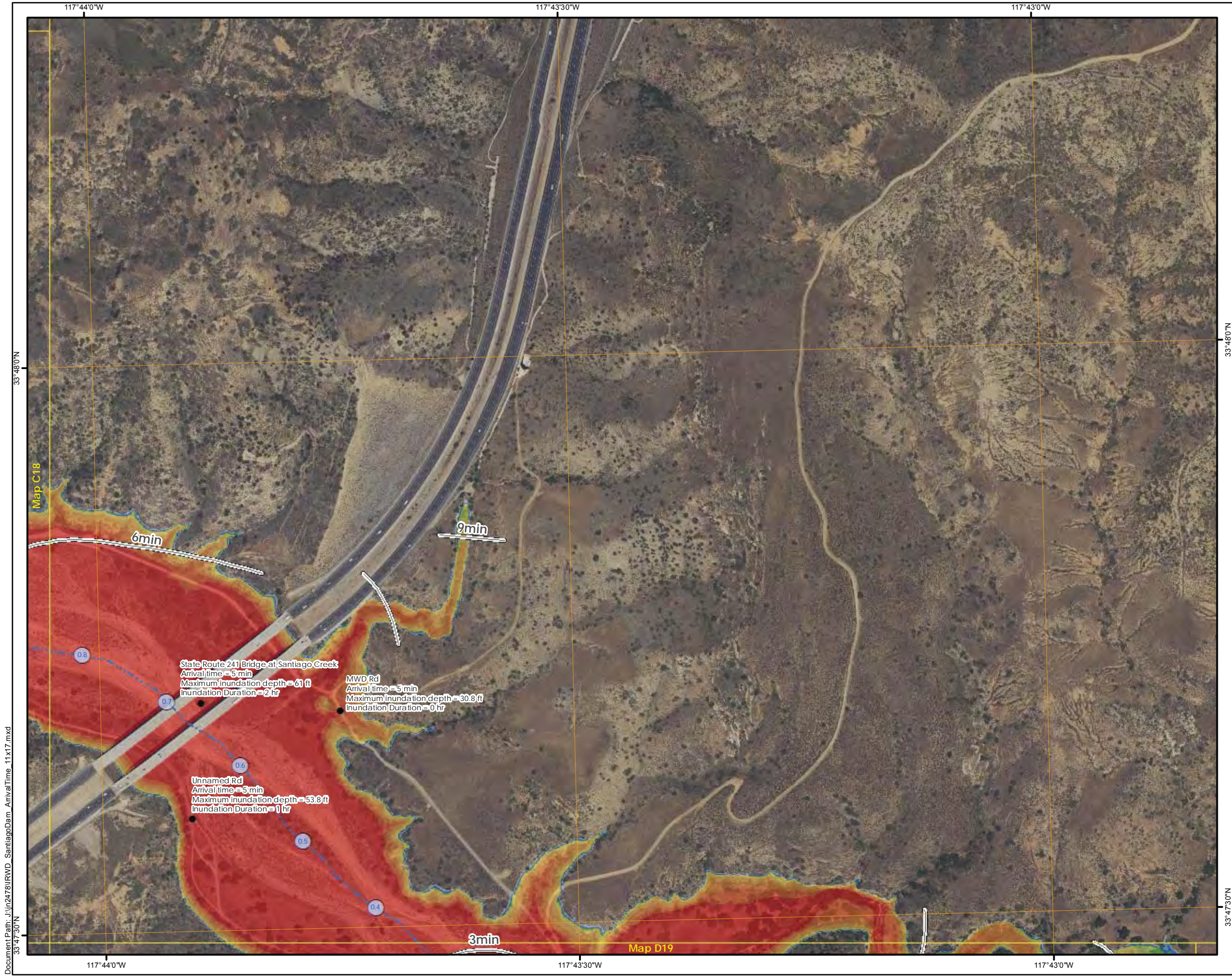
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 16 of 148



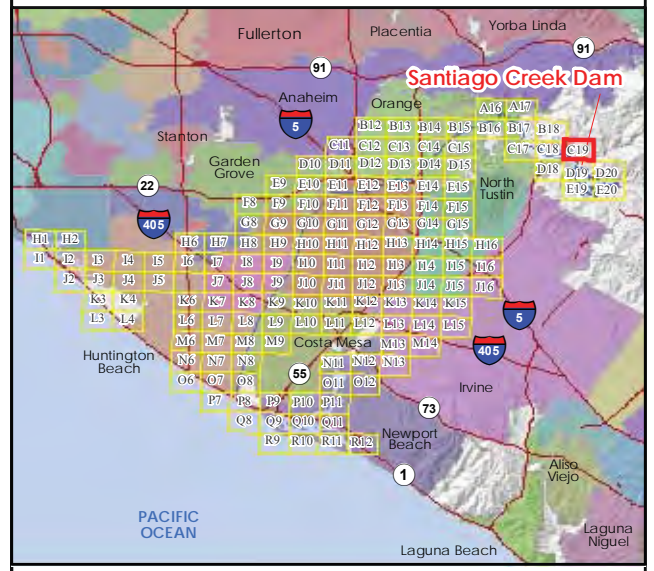
C18





# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

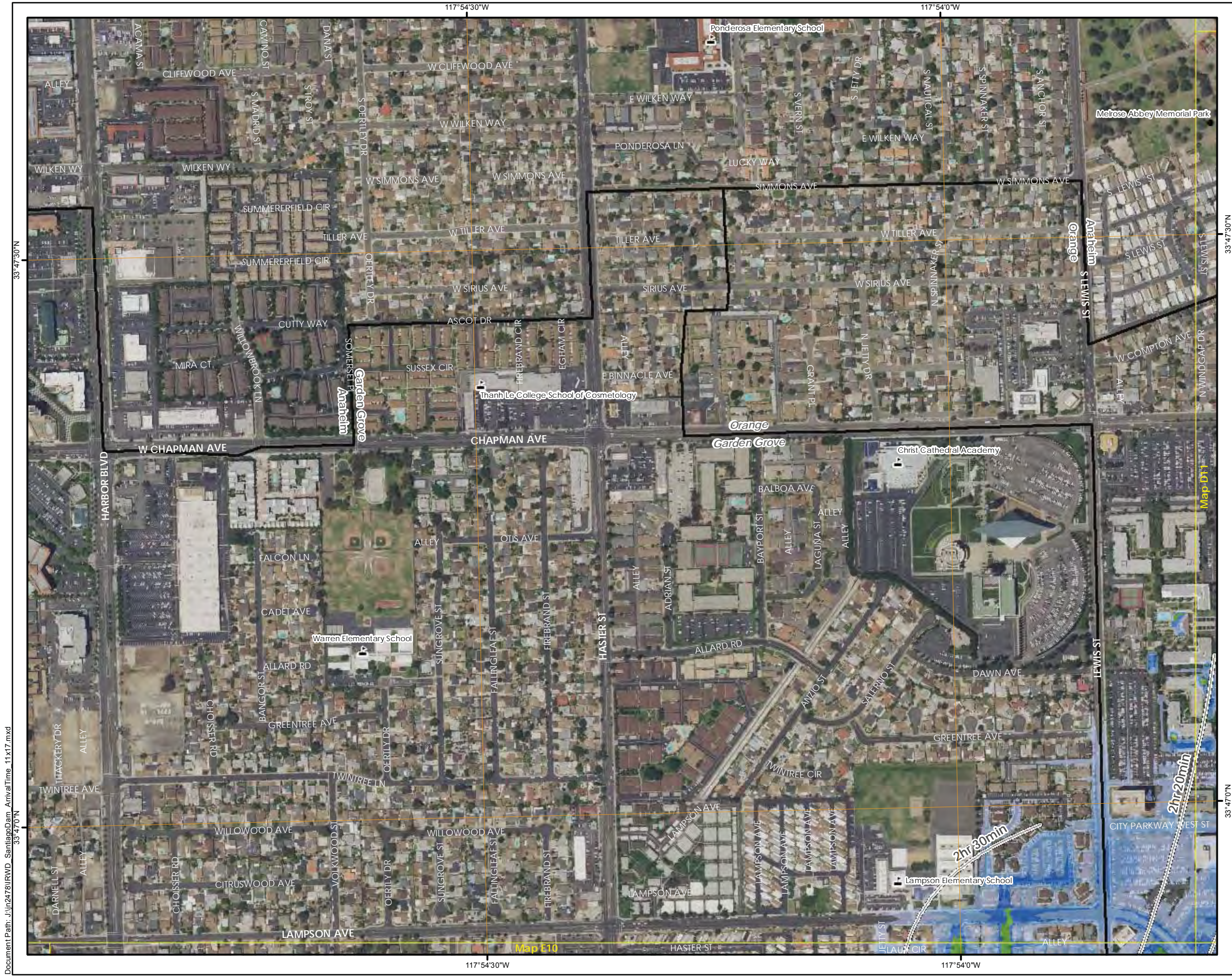
1/26/2018

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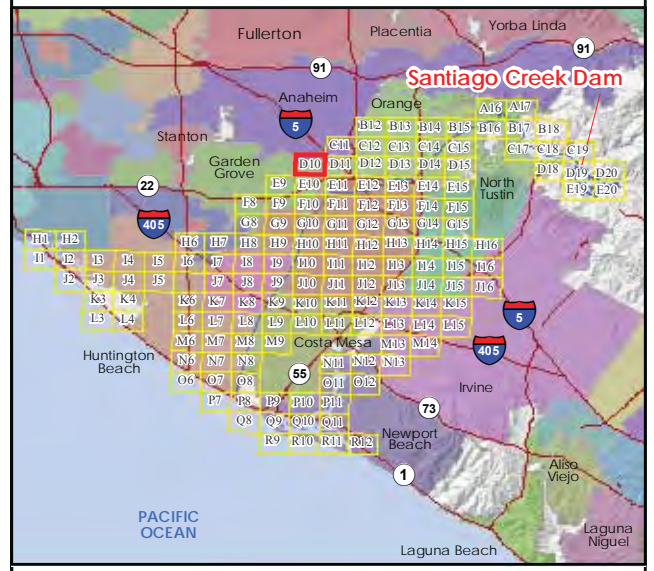
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

PANEL 17 of 148 **C19**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School


**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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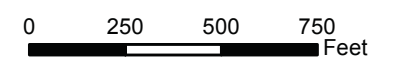
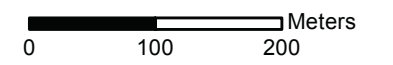
  
**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER  
 MOLLY R. PALMER  
 C 71788  
 EXP 12/31/19  
 CIVIL  
 STATE OF CALIFORNIA

PANEL 18 of 148

**D10**



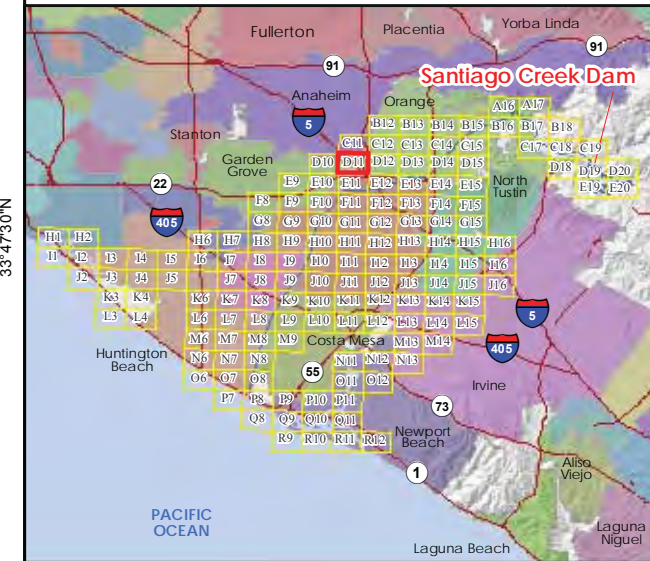
STETSON ENGINEERS INC.

117°53'30"W

117°53'0"W

117°52'30"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



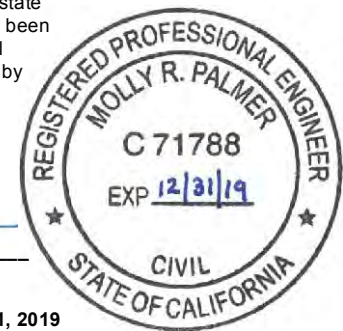
**Legend**

- |                       |          |
|-----------------------|----------|
| Map Panel #           | 0-1 ft   |
| Dam Crest             | 1-2 ft   |
| River                 | 2-3 ft   |
| Arrival Time          | 3-4 ft   |
| City Boundary         | 4-5 ft   |
| River Mile            | 5-10 ft  |
| School                | 10-20 ft |
| Fire Station          | 20-30 ft |
| Correctional Facility | 30-40 ft |
| Medical Facility      | >40 ft   |

1/26/2018

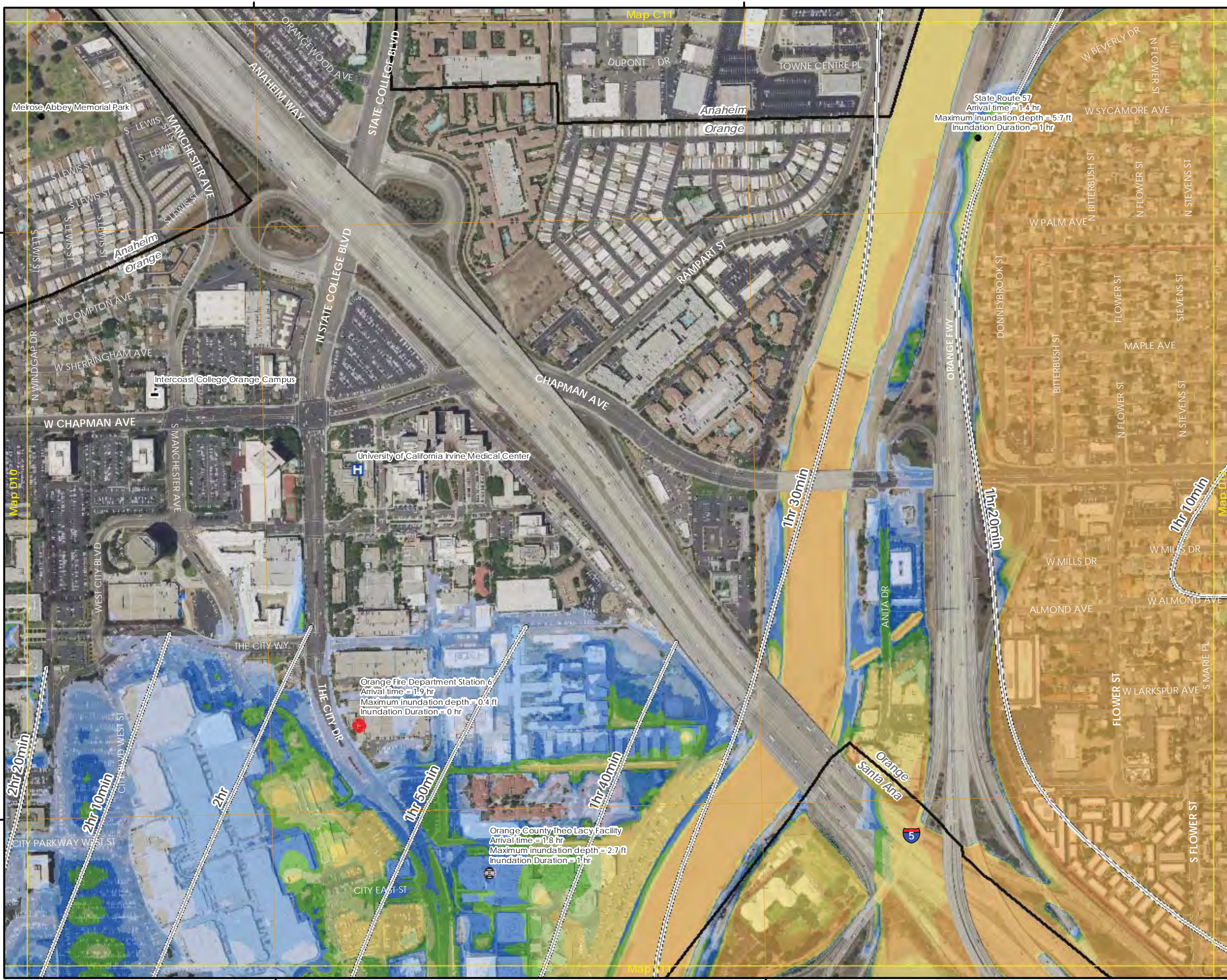
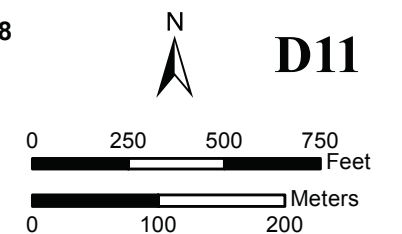
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Civil Engineer 71788  
Expiration Date December 31, 2019

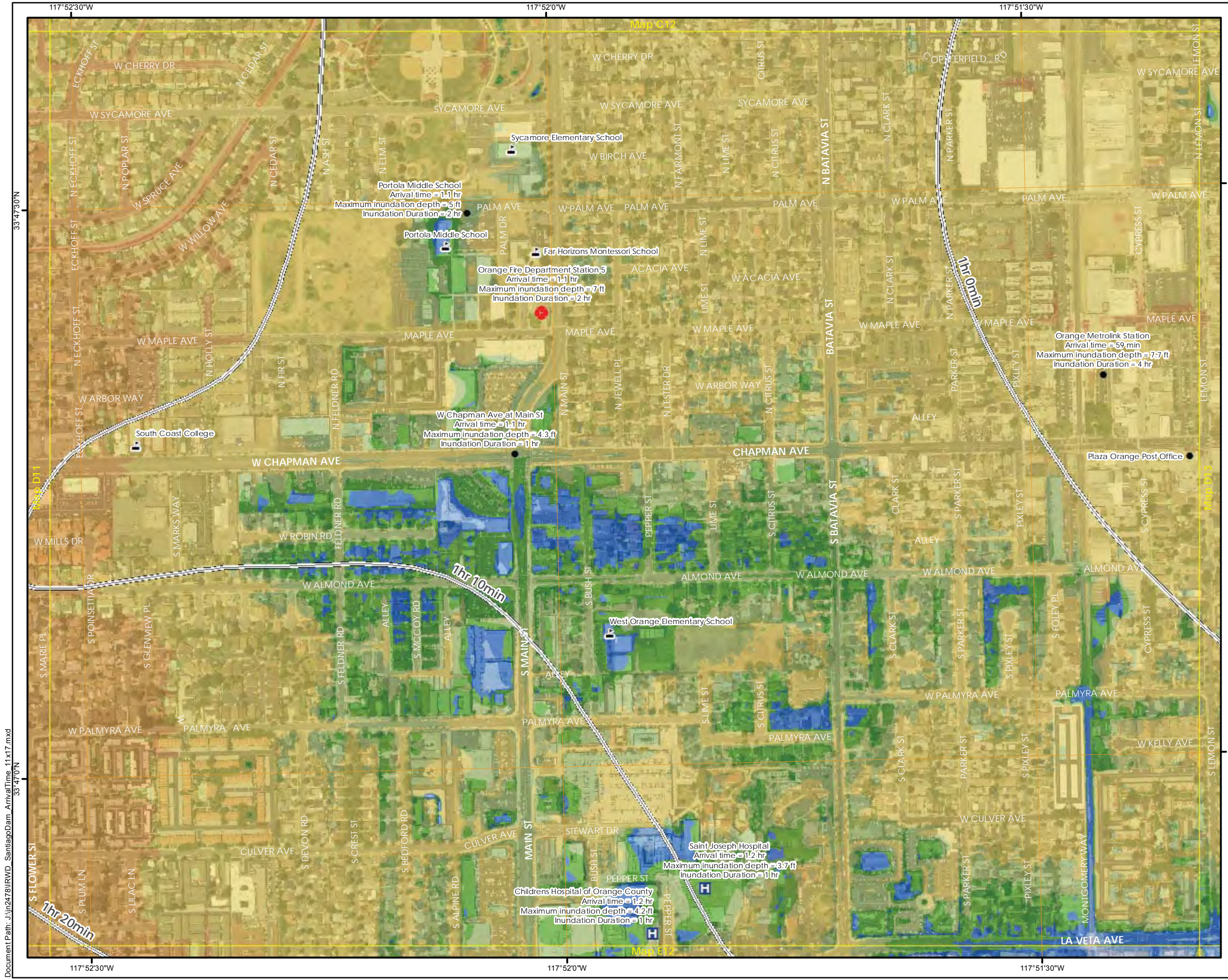
PANEL 19 of 148



117°53'30"W

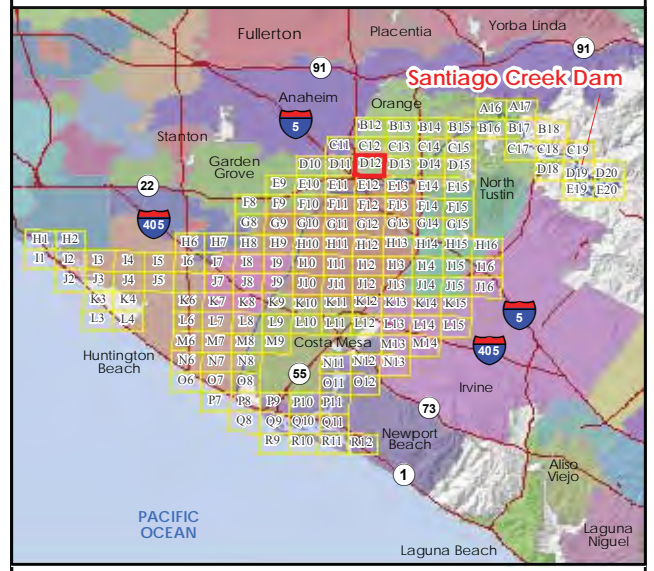
117°53'0"W

117°52'30"W



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- F School
- F Fire Station
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

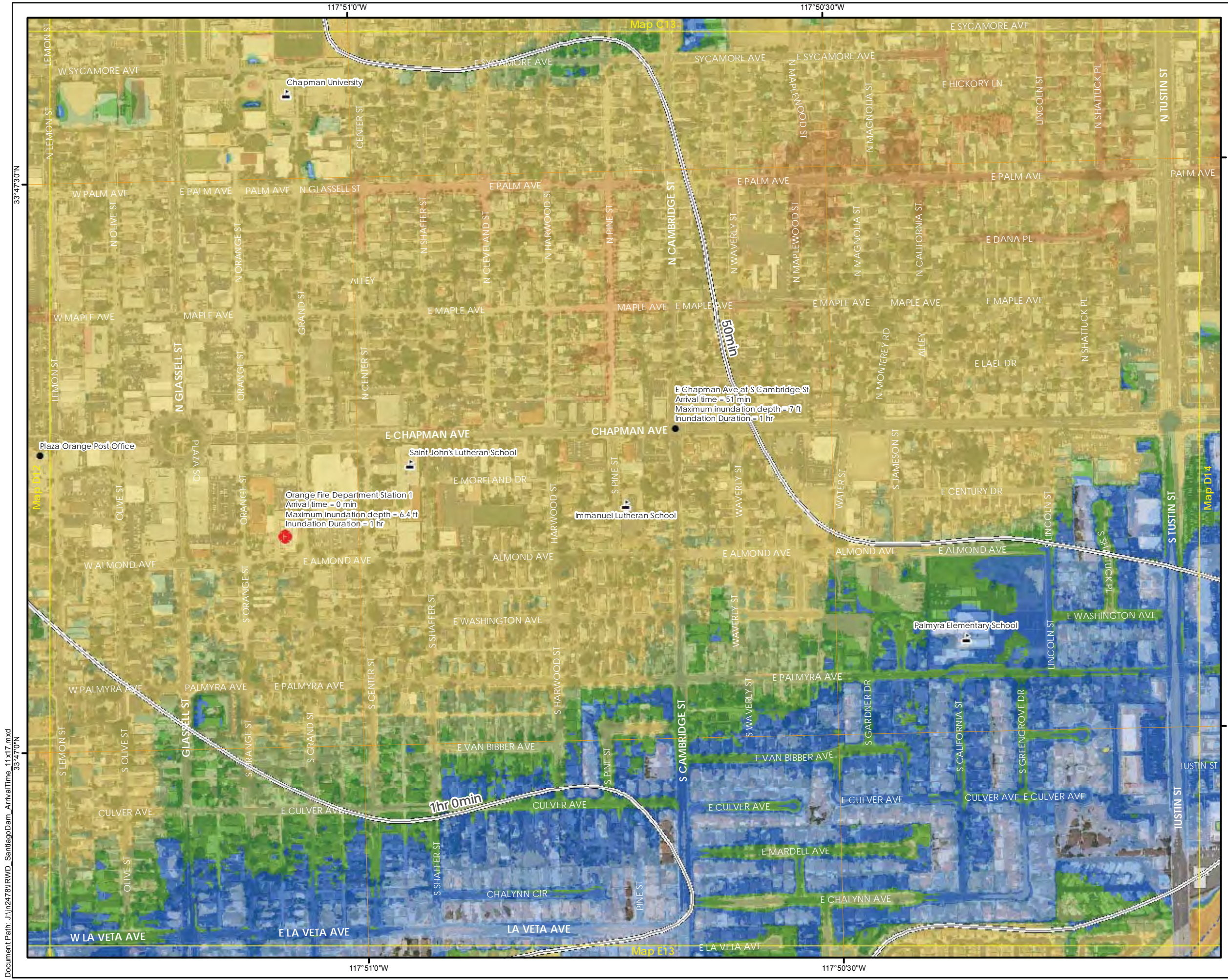
PANEL 20 of 148

N

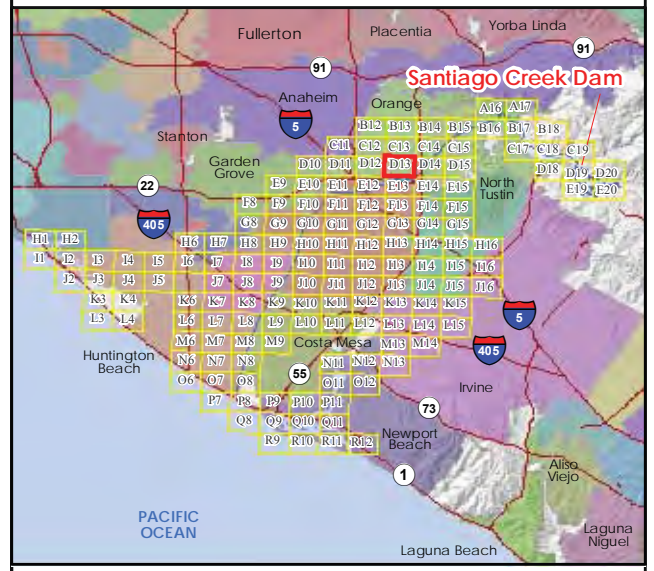
**D12**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

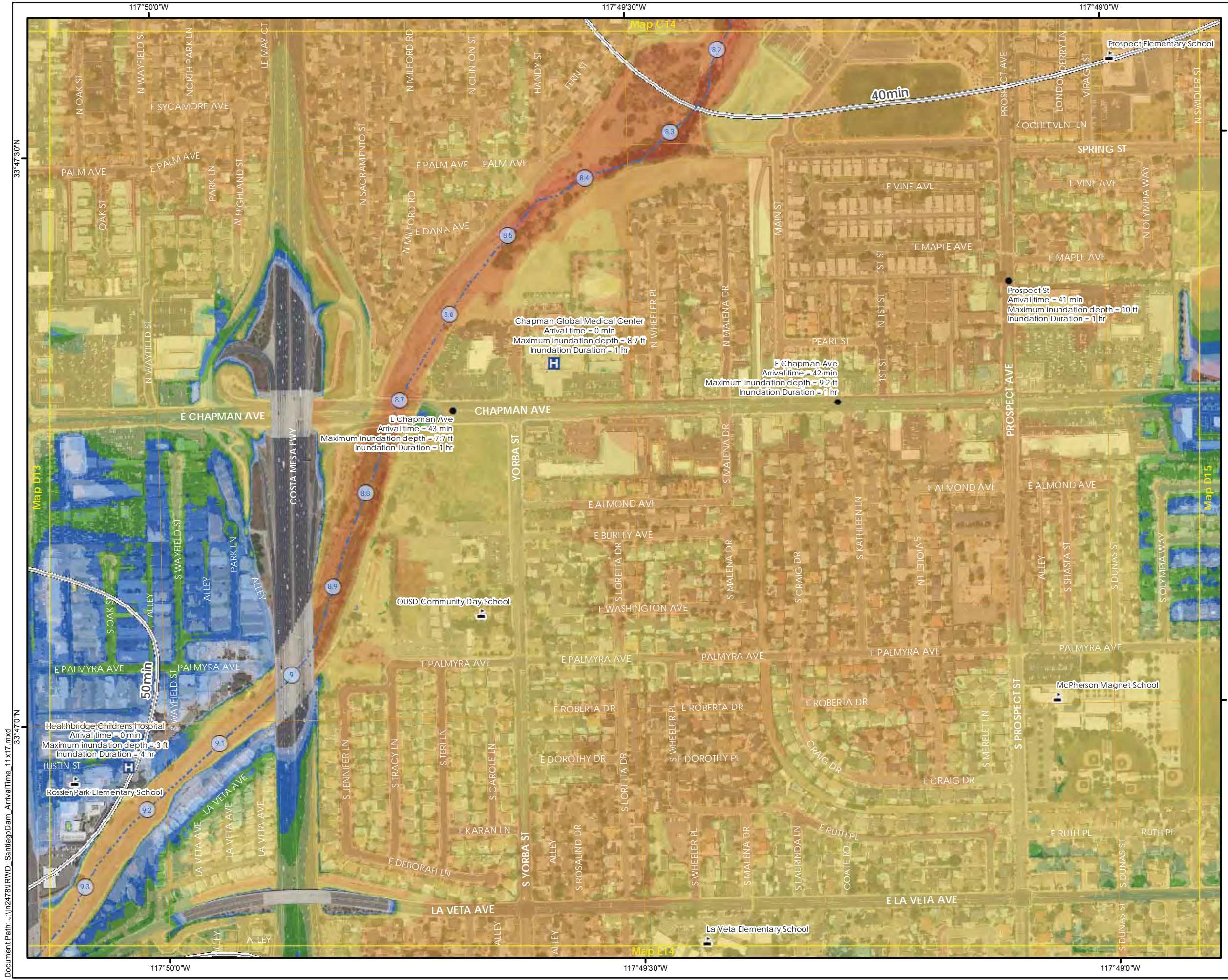
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 21 of 148

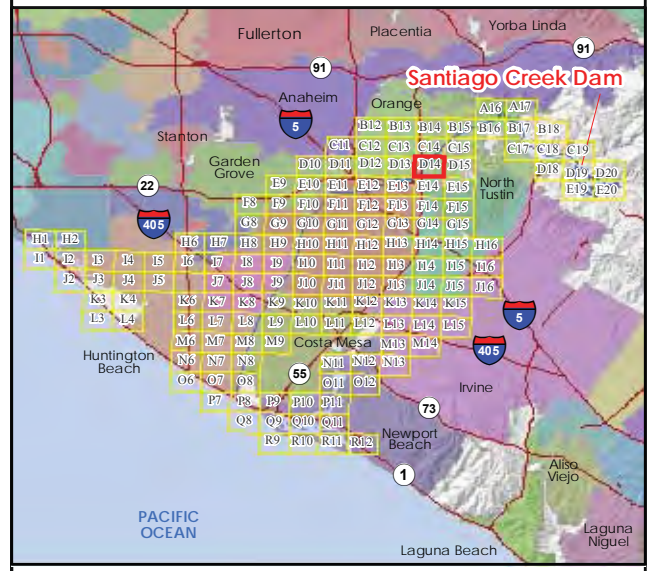
**D13**

**STETSON**  
ENGINEERS INC.





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- 🏫 School
- H Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

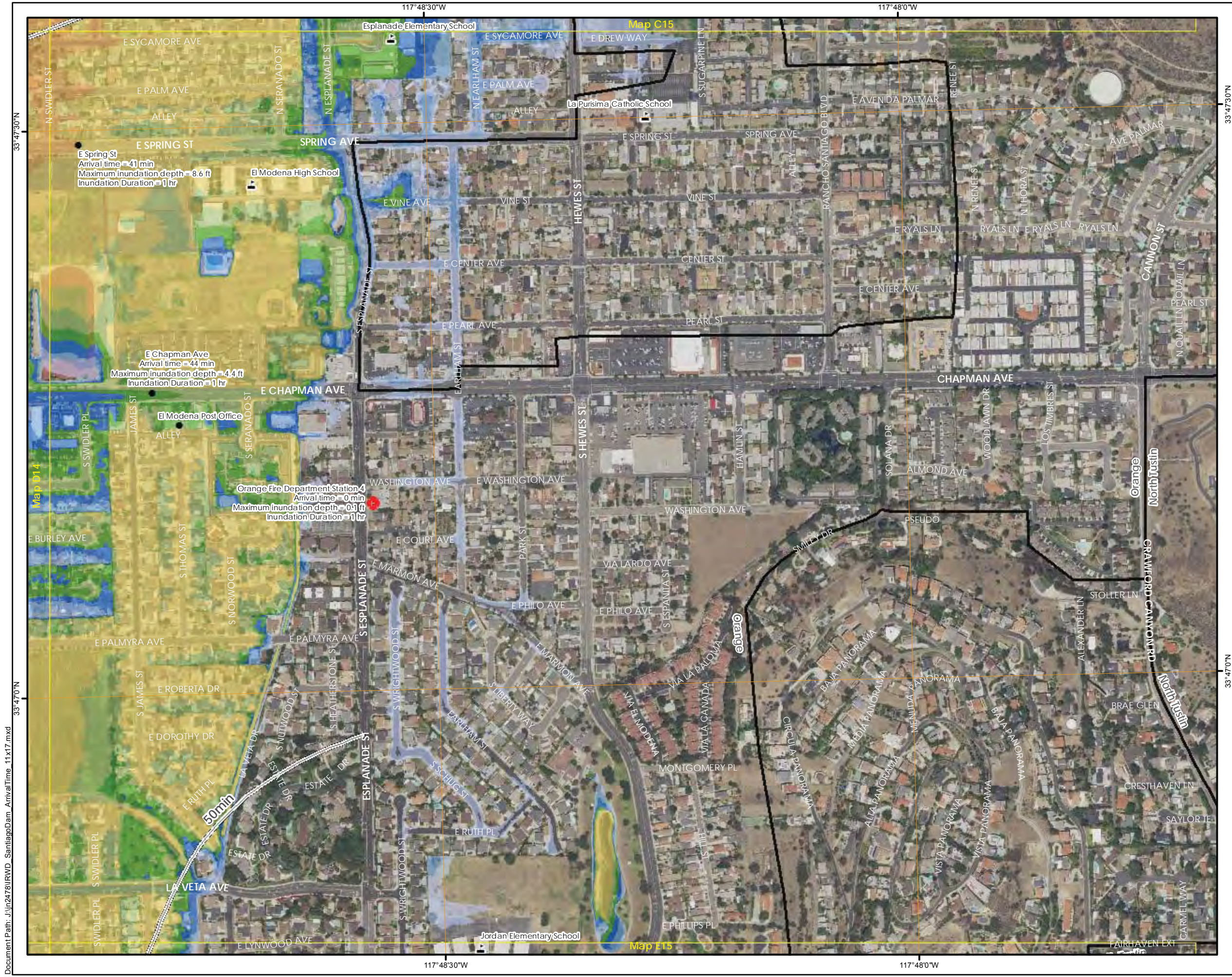
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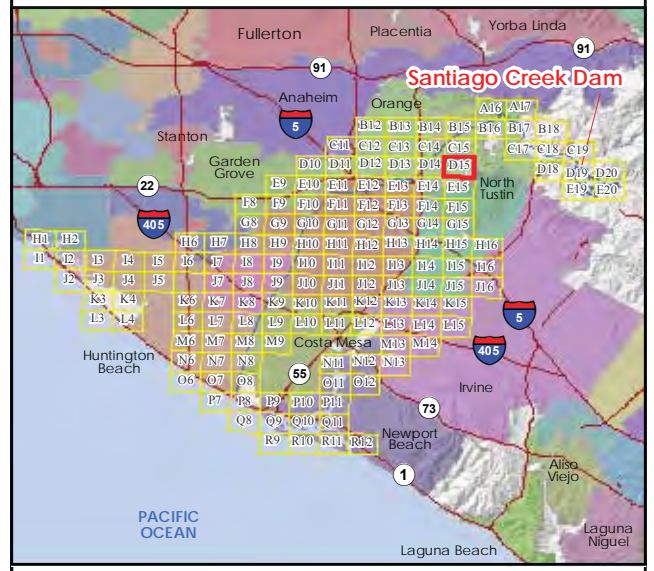
**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

**PANEL 22 of 148**

**D14**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

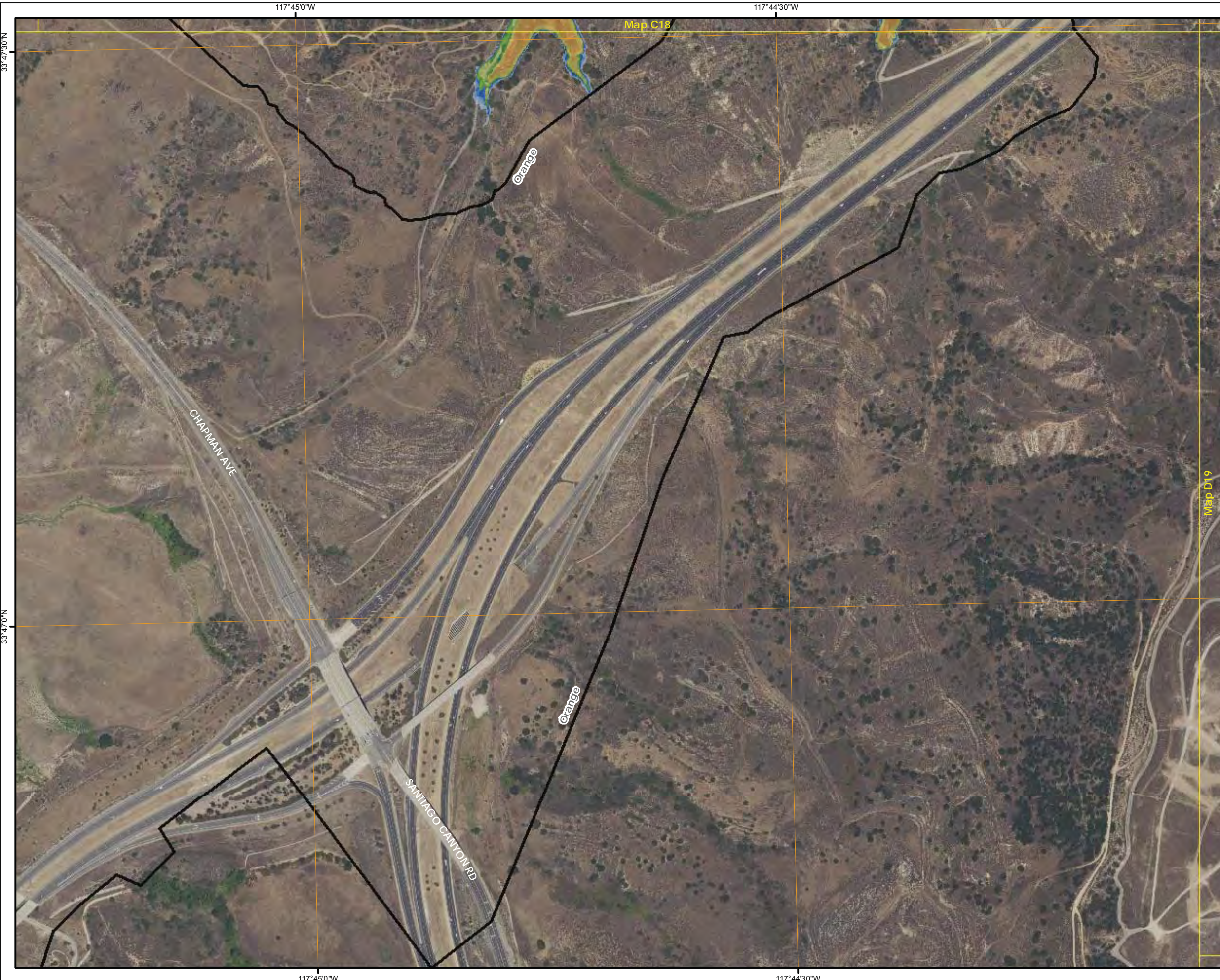
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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

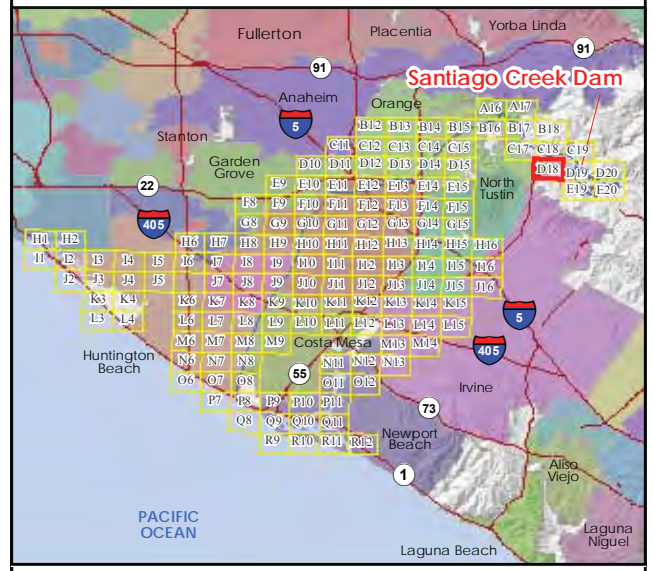
REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

PANEL 23 of 148

**D15**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

Maximum Inundation Depth, Sunny Day Failure

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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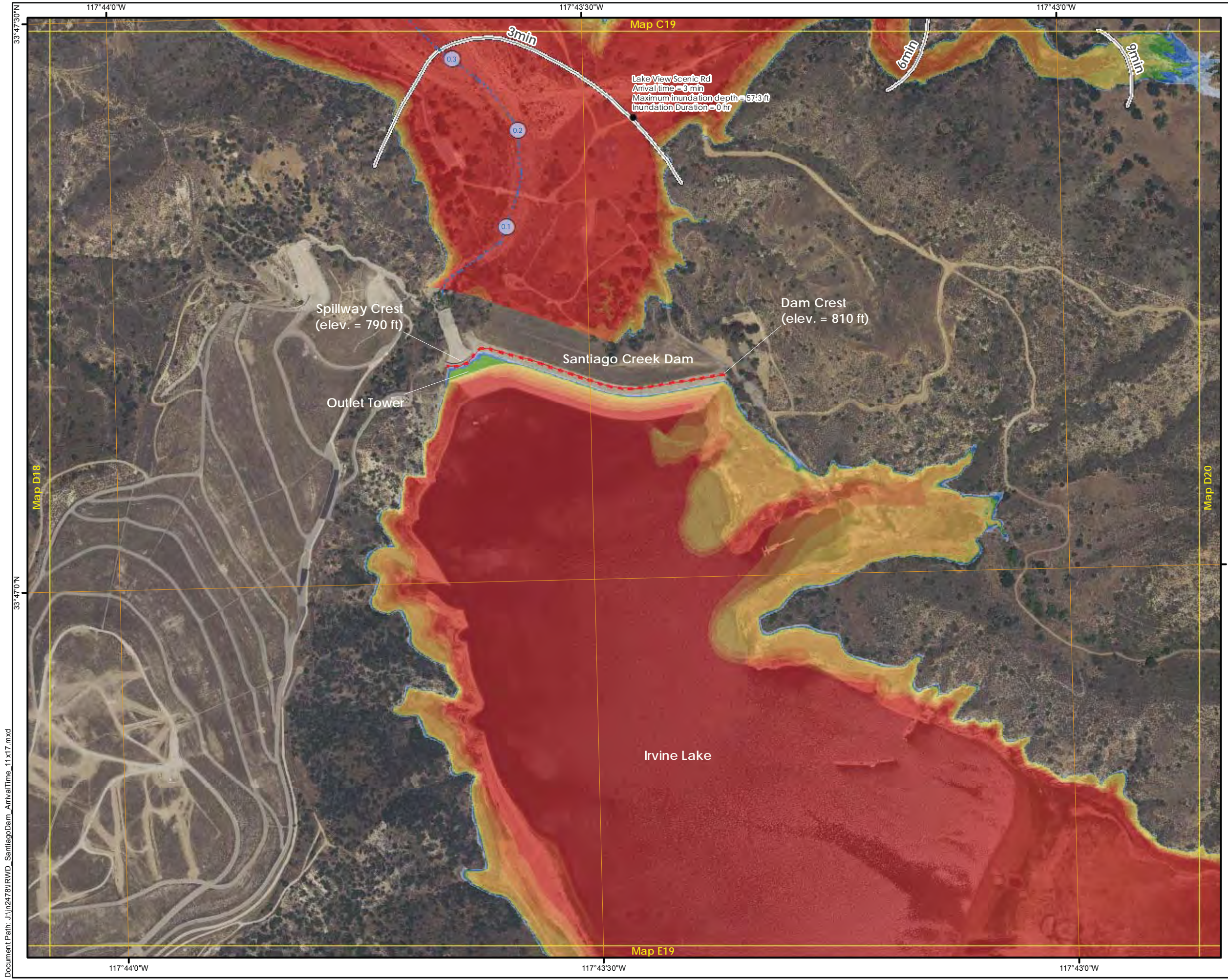
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

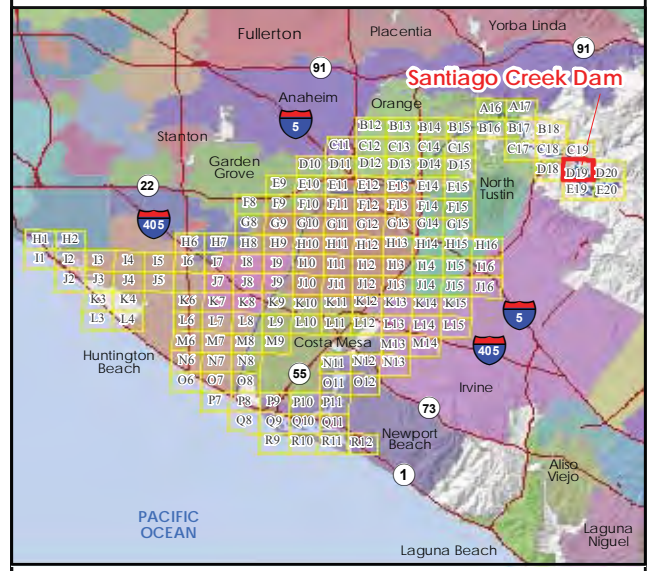
PANEL 24 of 148

**D18**

**STETSON**  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

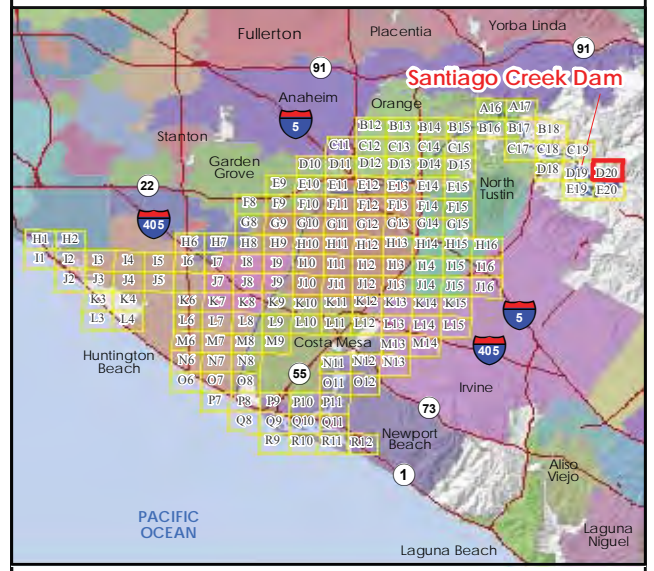
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 25 of 148**

**D19**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

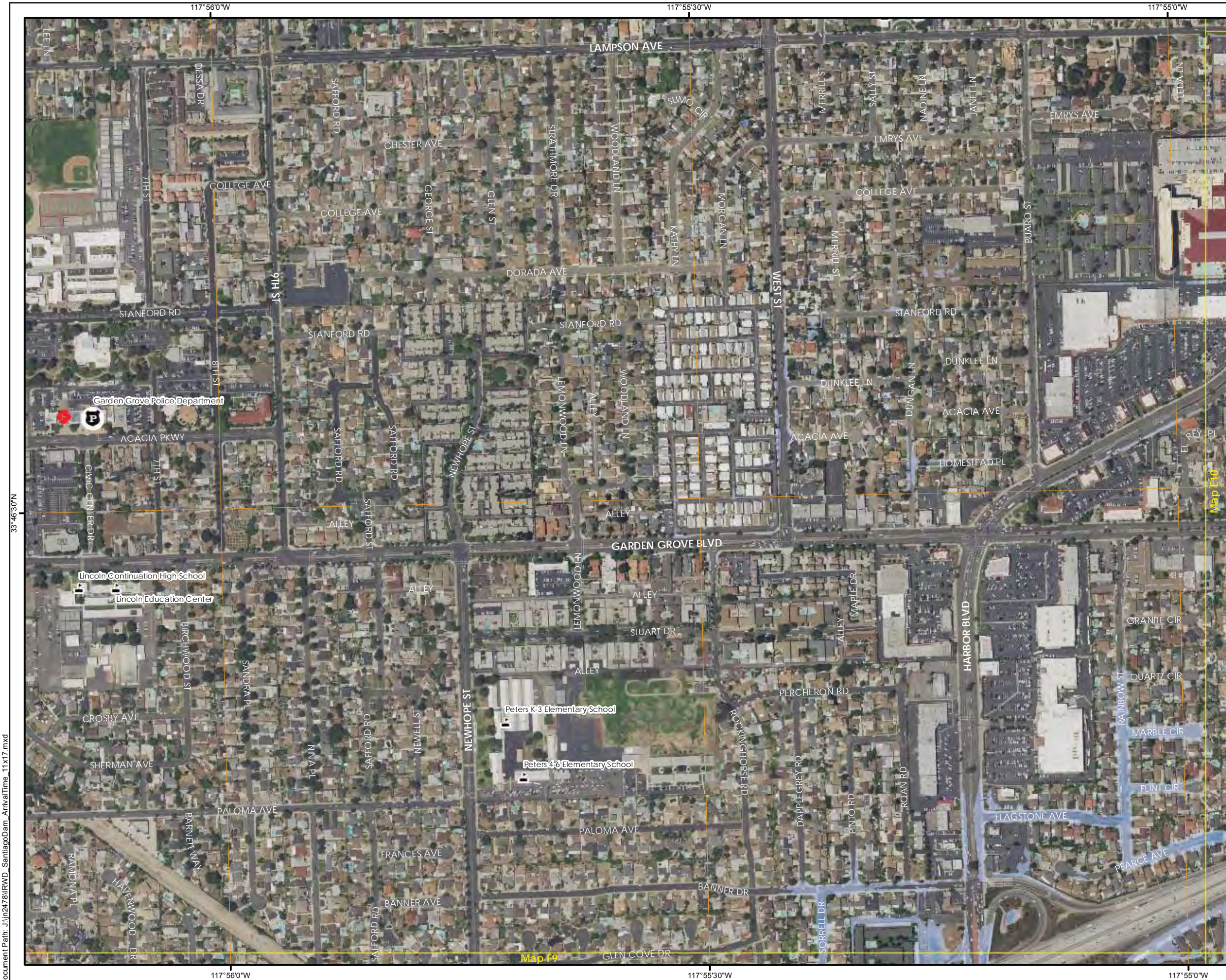
**PANEL 26 of 148**

**D20**

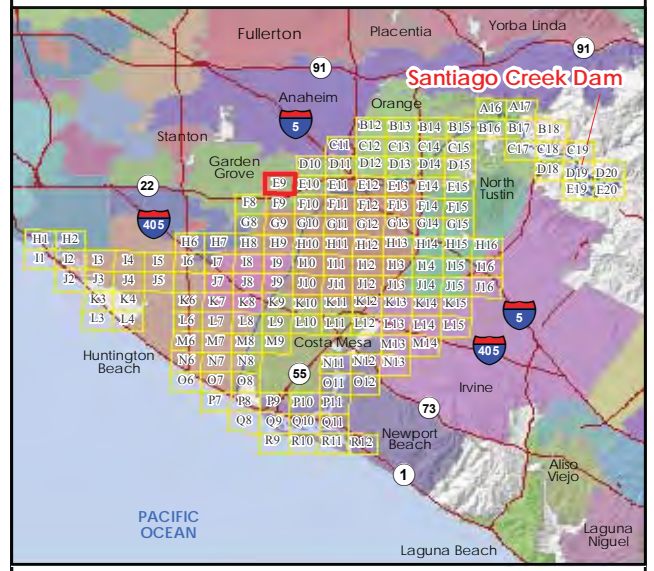
N

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

Map Panel #	0-1 ft
Dam Crest	1-2 ft
River	2-3 ft
Arrival Time	3-4 ft
City Boundary	4-5 ft
River Mile	5-10 ft
School	10-20 ft
Fire Station	20-30 ft
Police Station	30-40 ft
	>40 ft

1/26/2018

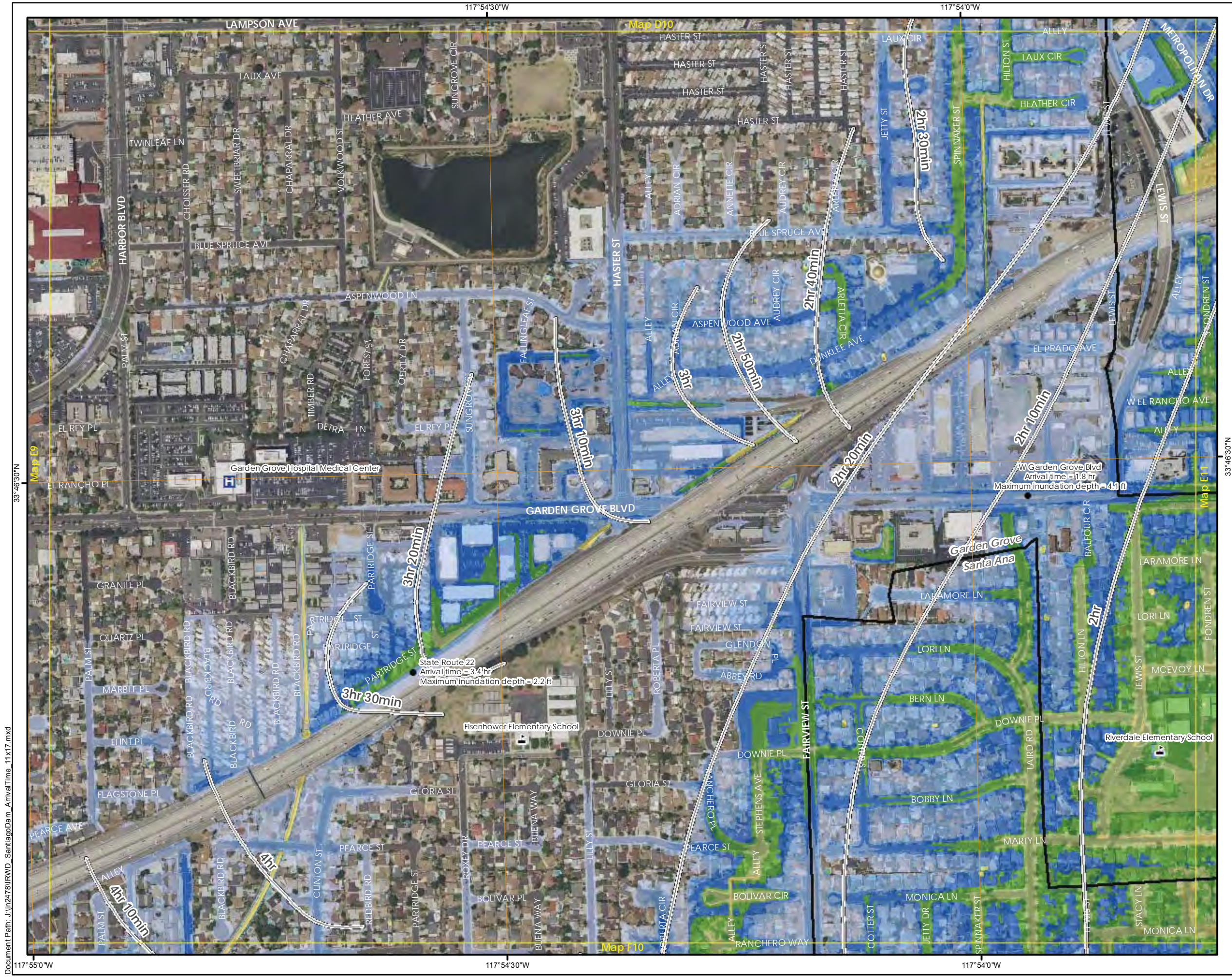
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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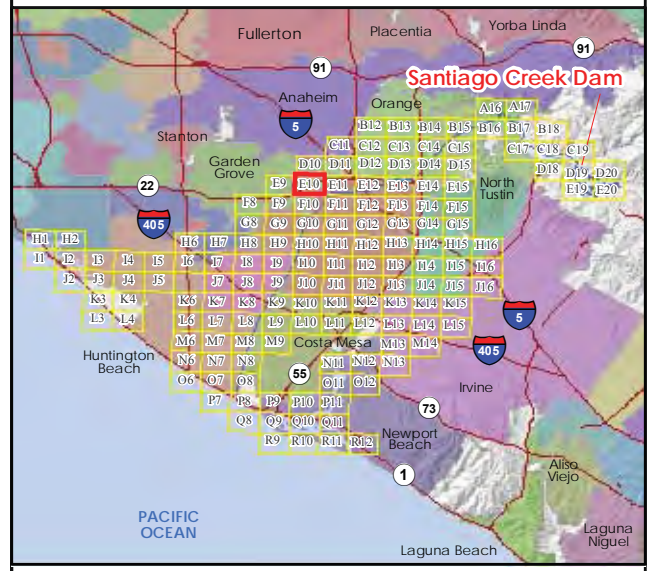
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 27 of 148

**E9**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

**PANEL 28 of 148**

E10

**STETSON**  
ENGINEERS INC.

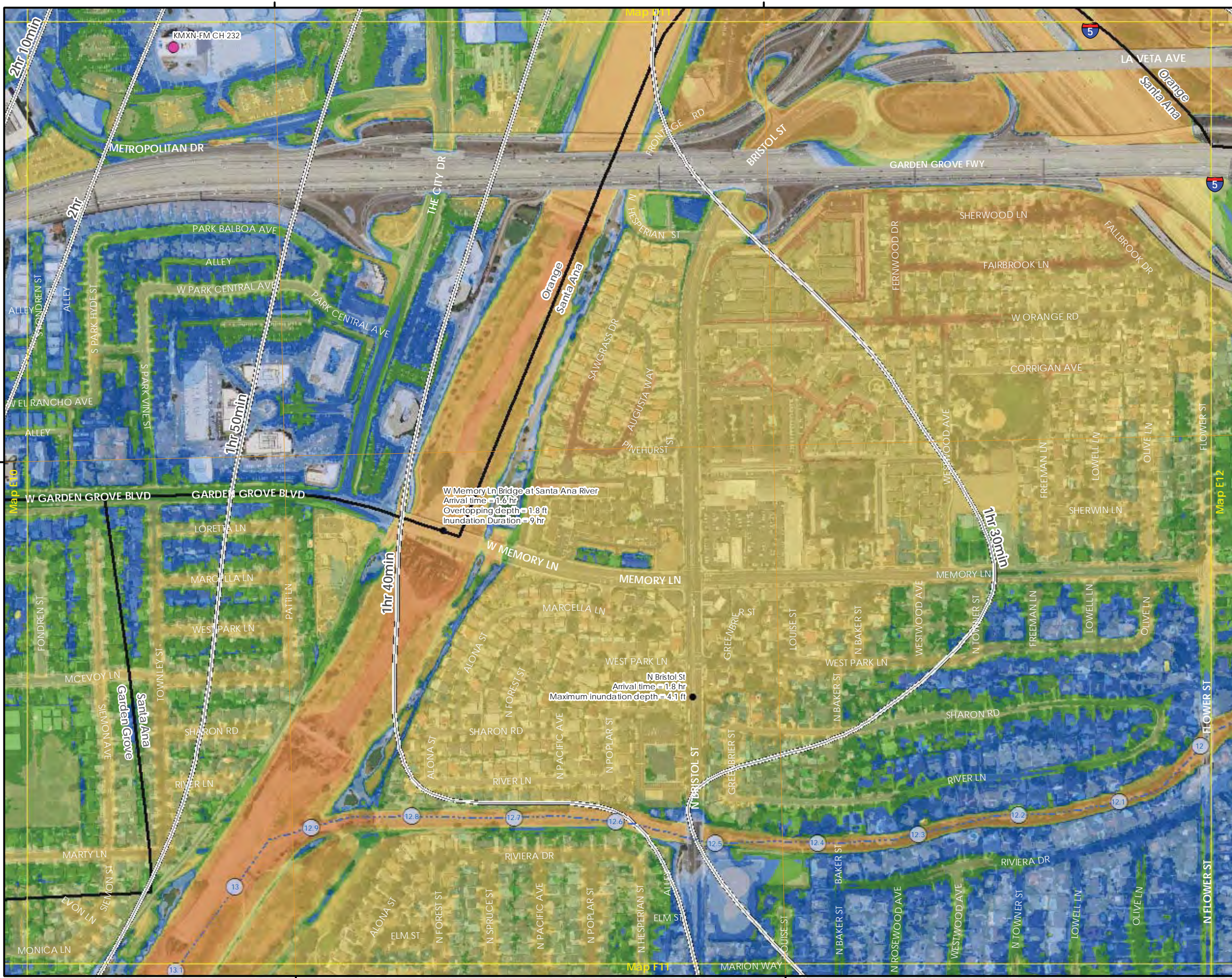
117°53'30"W

117°53'0"W

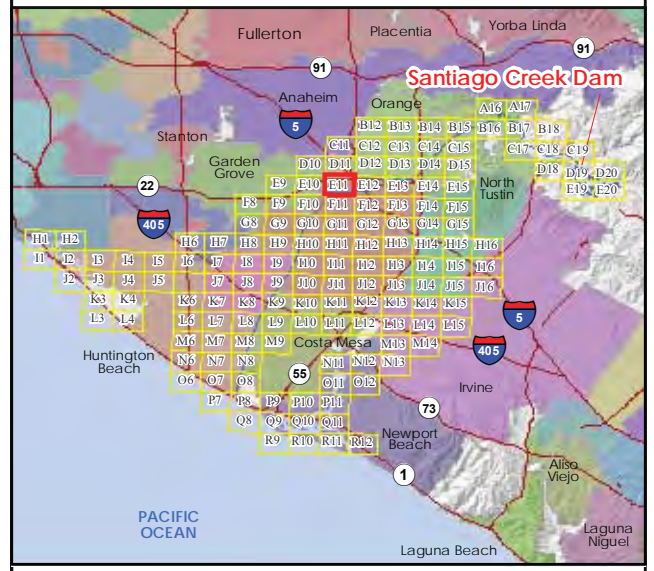
117°53'30"W

117°53'0"W

Document Path: J:\m2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- Communications Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

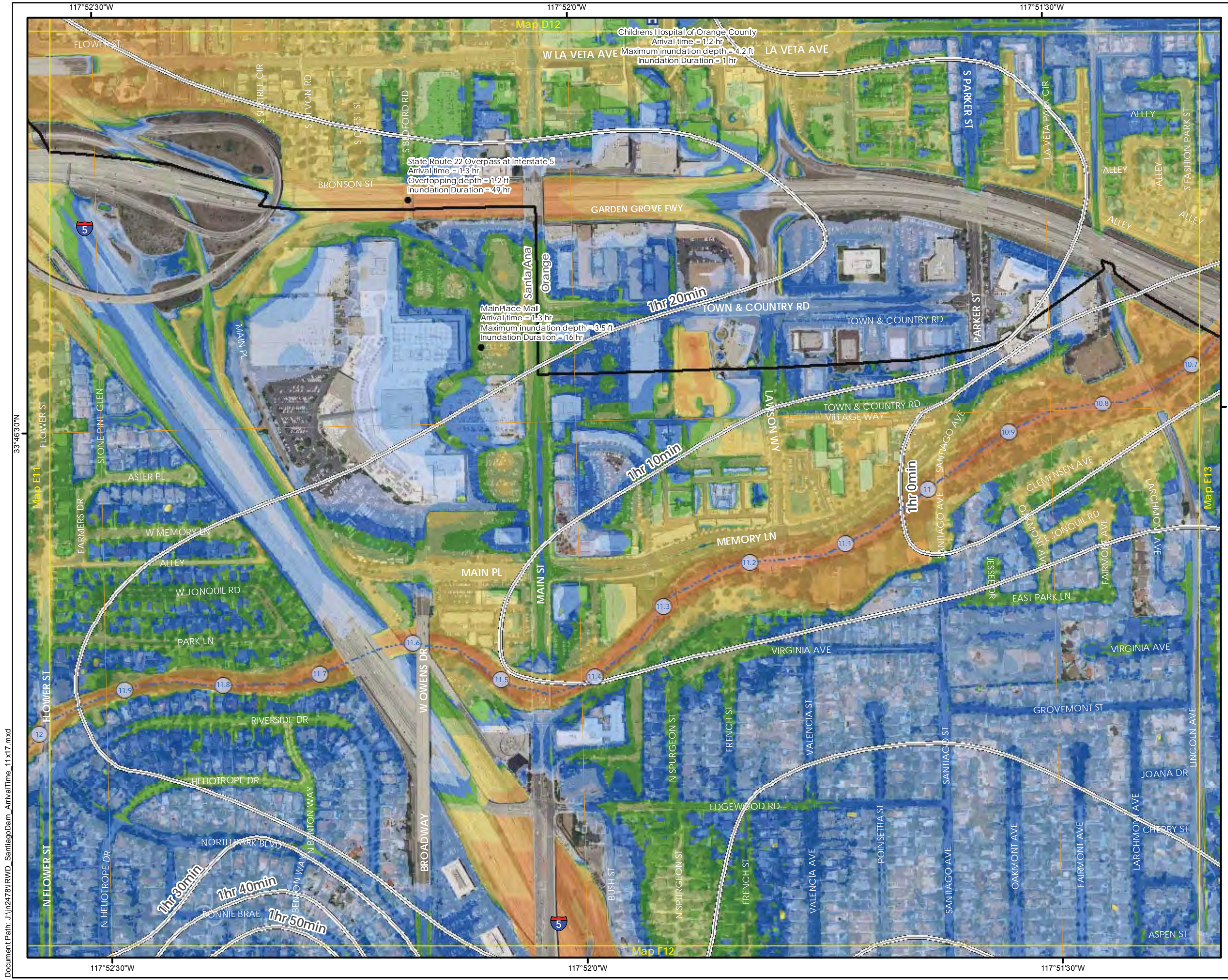
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 29 of 148**

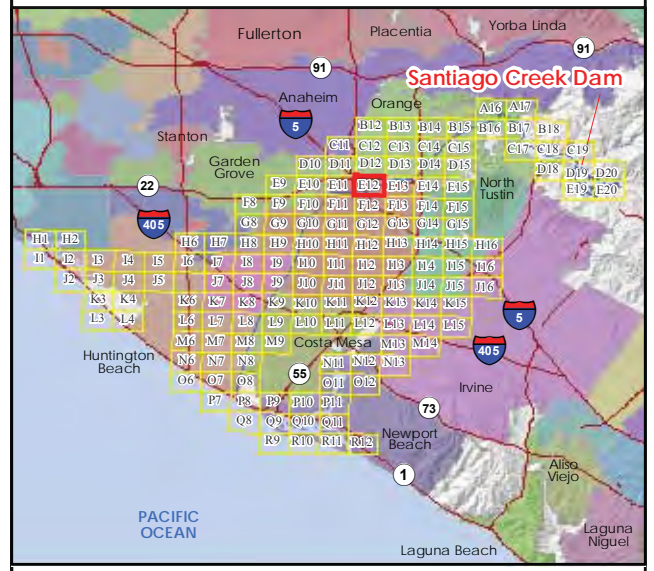
**STETSON**  
ENGINEERS INC.

**E11**





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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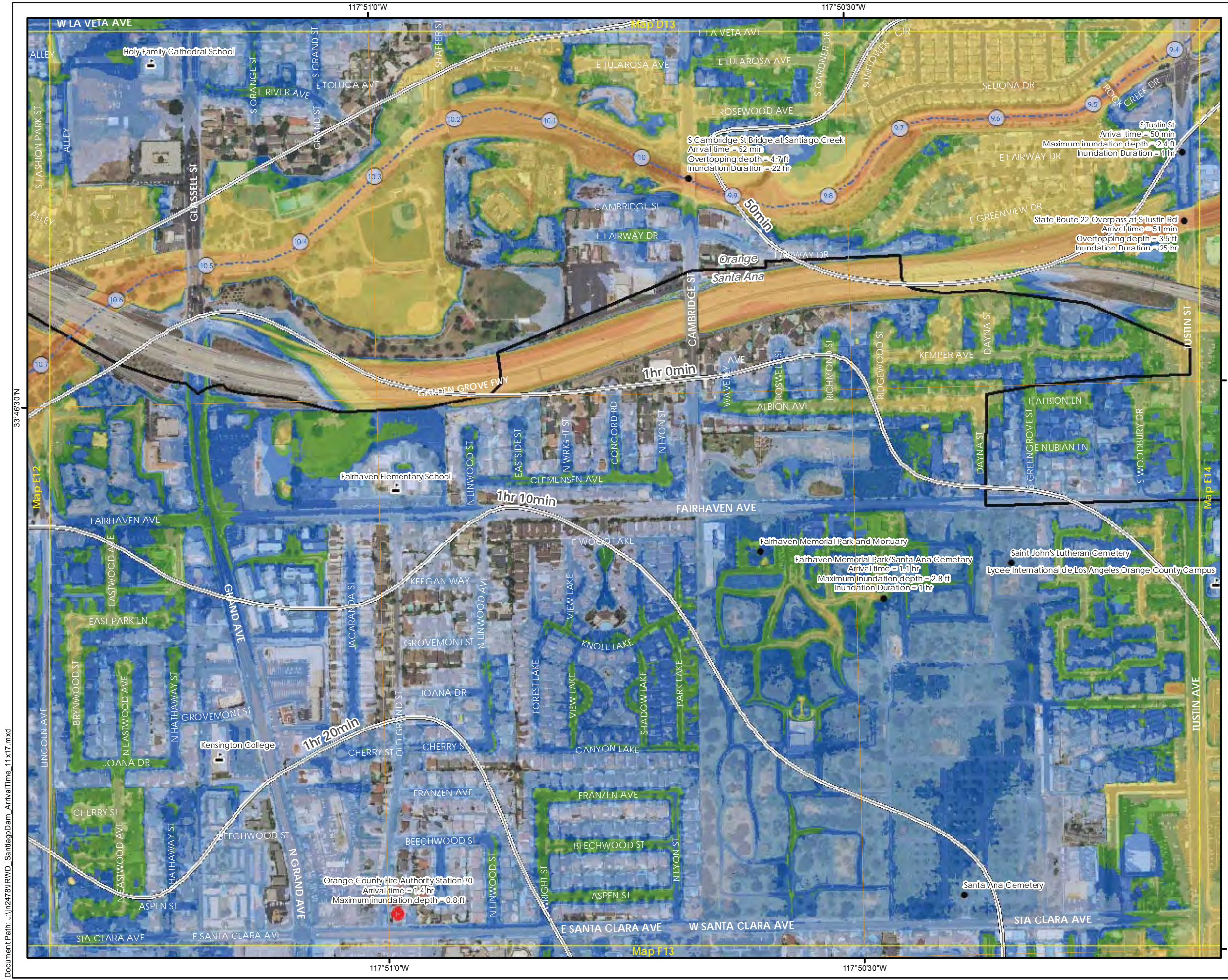
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*

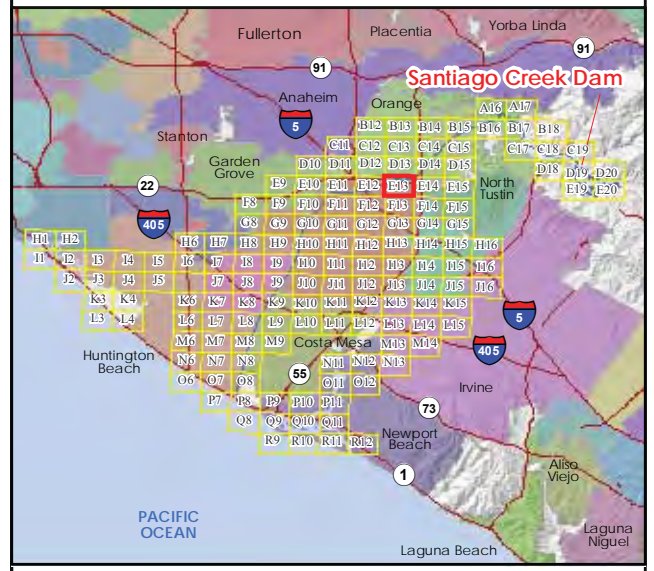
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 30 of 148

**E12**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

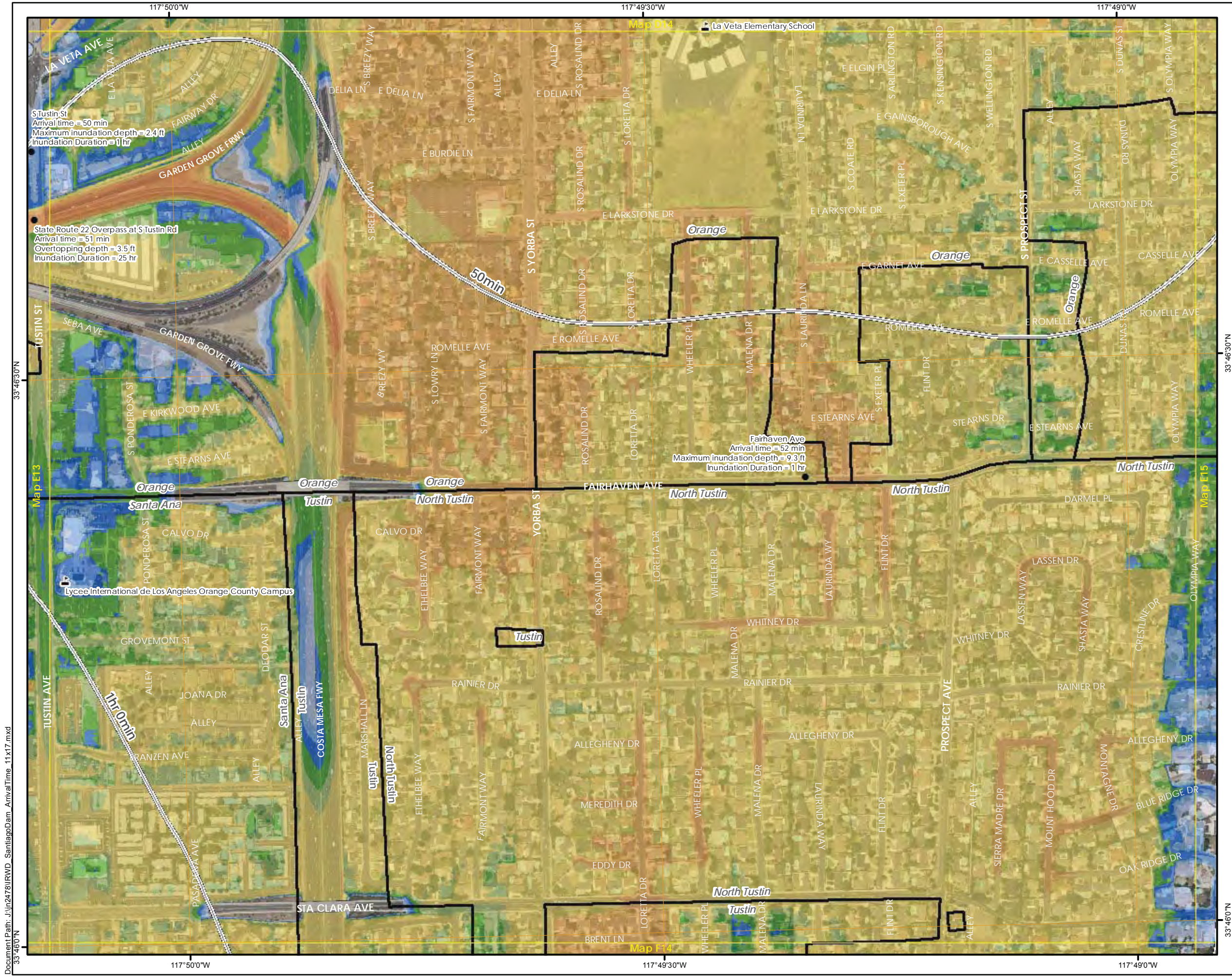
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 31 of 148

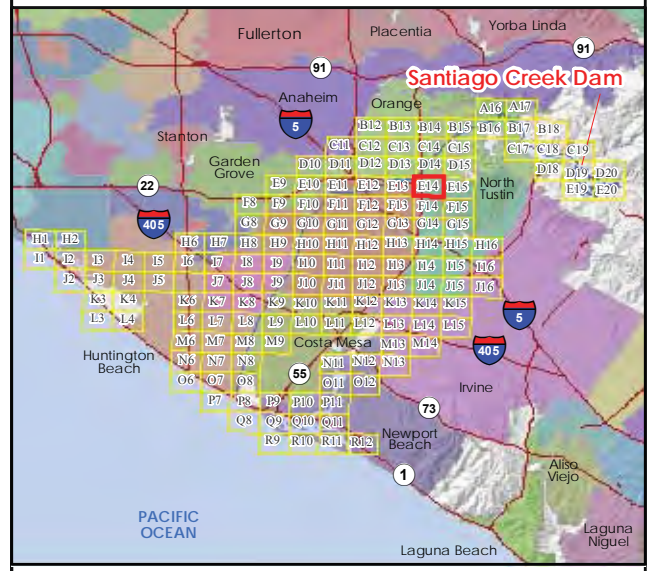
**E13**

0 250 500 750  
Feet

0 100 200  
Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

PANEL 32 of 148

**STETSON**  
ENGINEERS INC.

N

**E14**

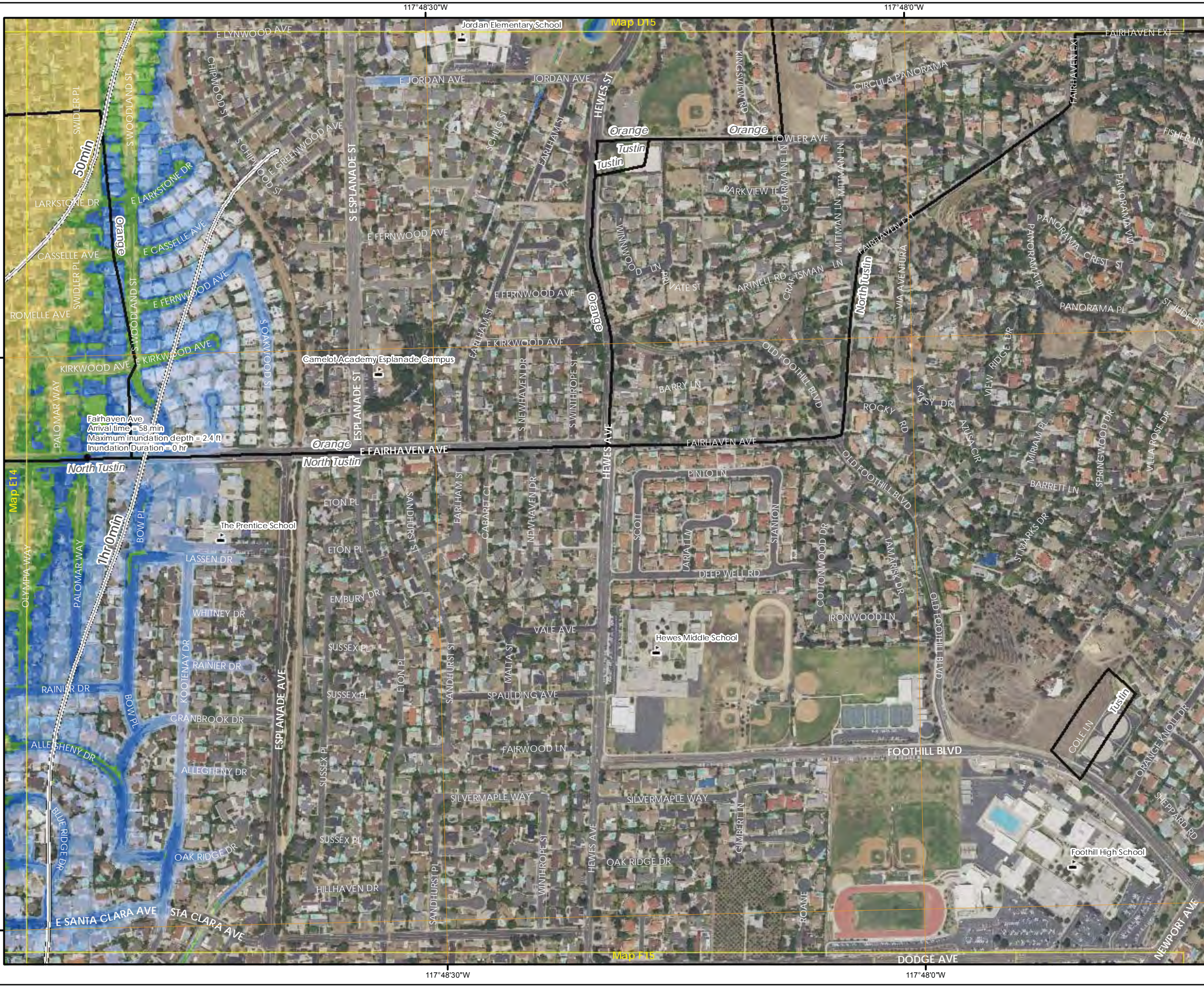
0 250 500 750

Feet

0 100 200

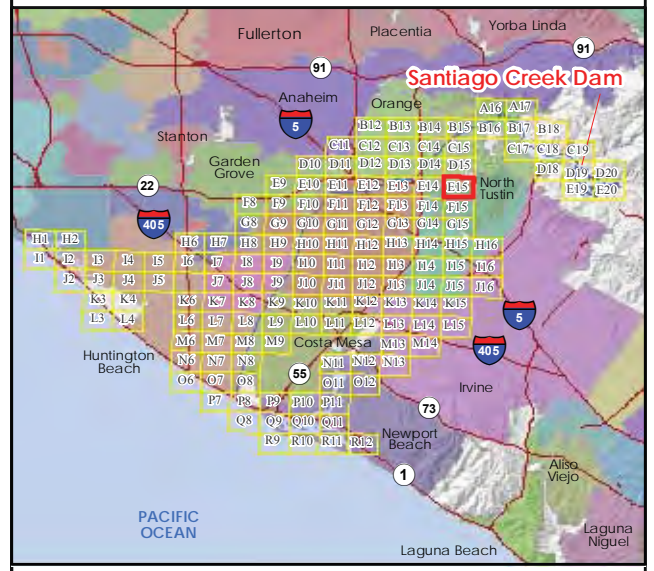
Meters

Document Path: \\jnp2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd  
33°46'0"N



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

PANEL 33 of 148

STETSON  
ENGINEERS INC.

N

**E15**

0 250 500 750 Feet

0 100 200 Meters

117°48'30"W

117°48'0"W

117°48'30"W

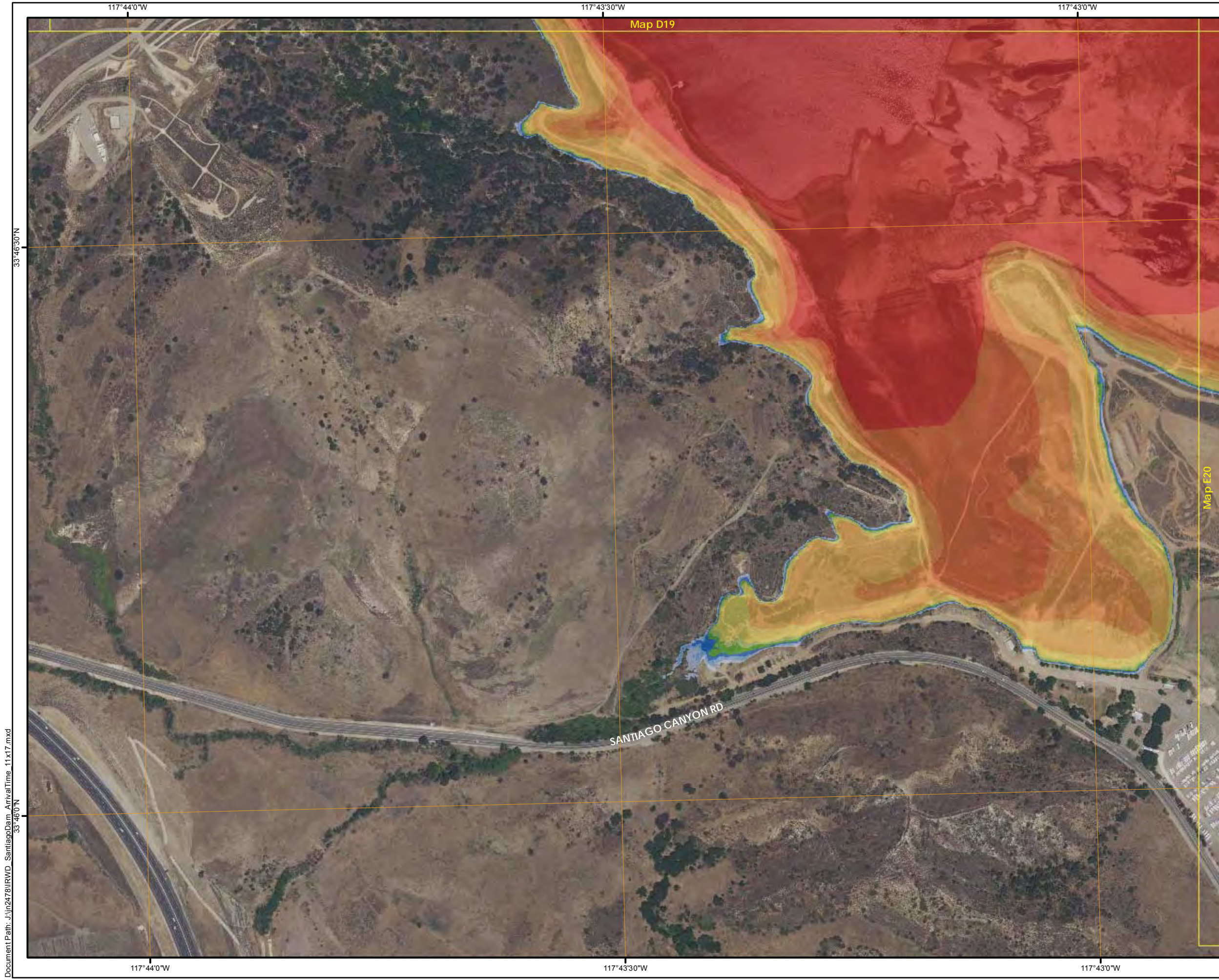
117°48'0"W

33°46'30"N

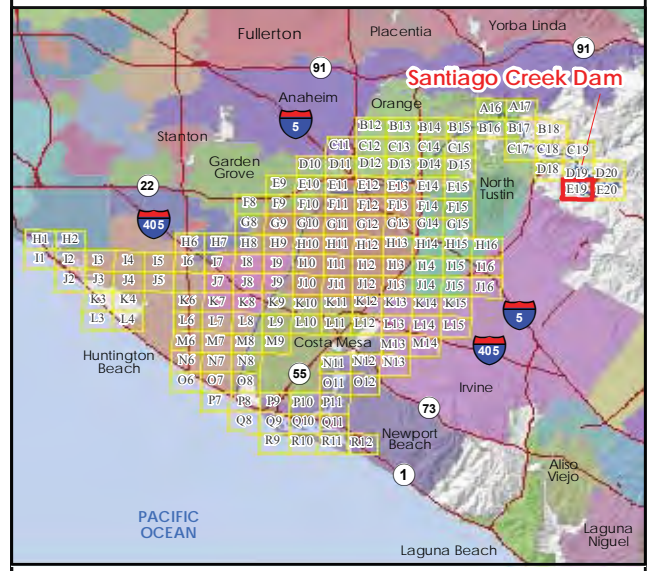
33°46'0"N

Map D15

Map F15



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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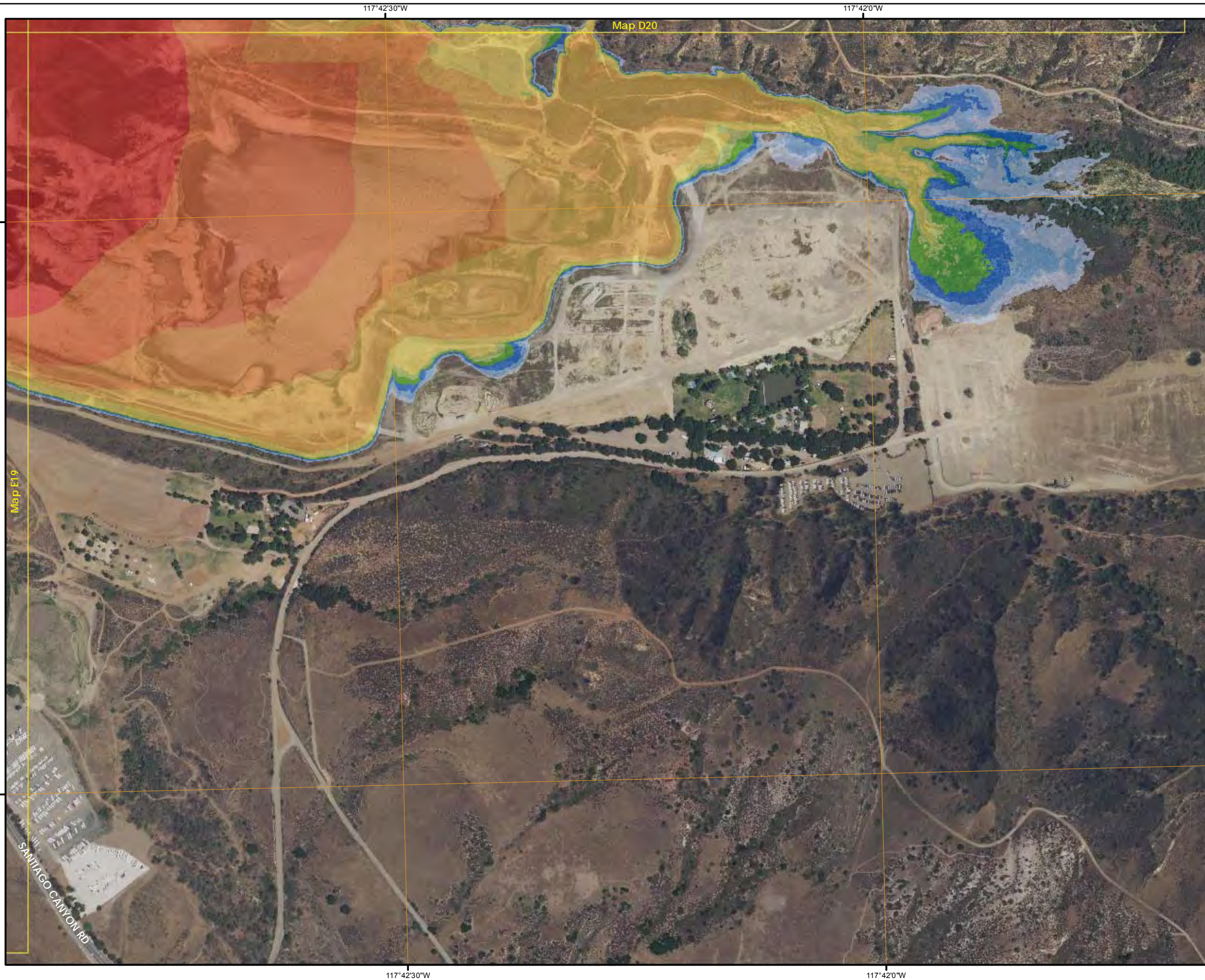
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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

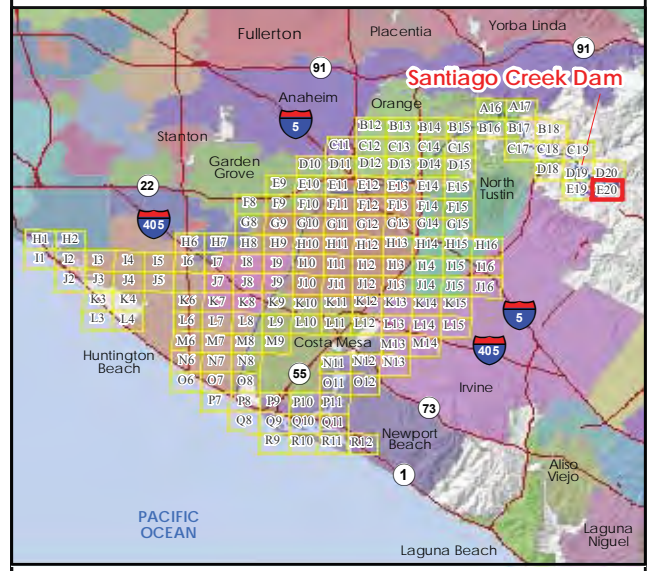
PANEL 34 of 148

**E19**

**STETSON**  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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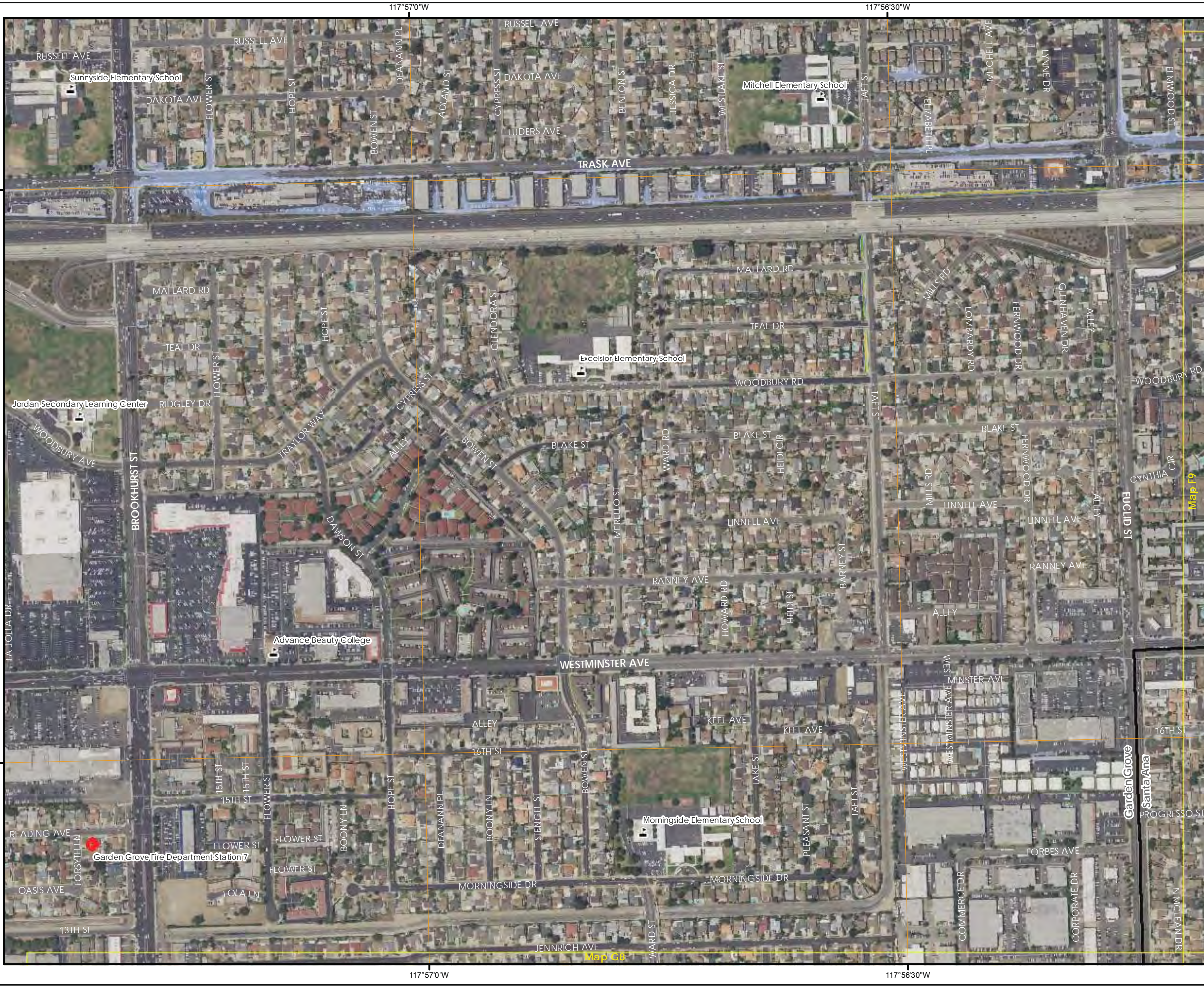
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 35 of 148

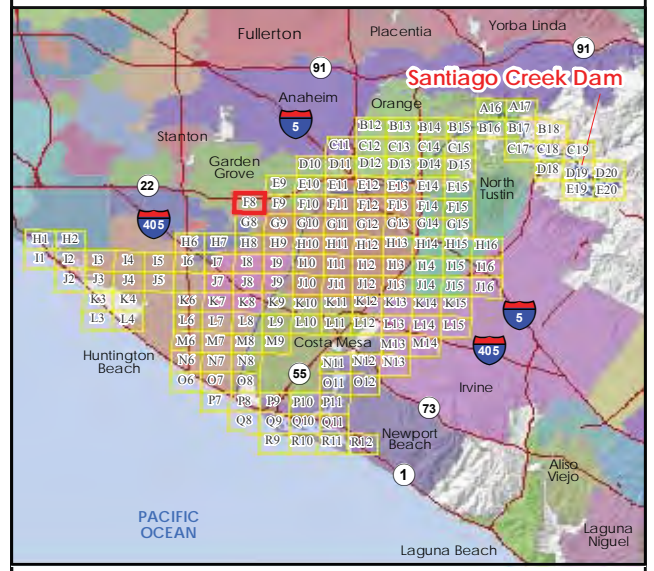
**E20**

**STETSON**  
ENGINEERS INC.

Document Path: \\j\m2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd 33°46'30"N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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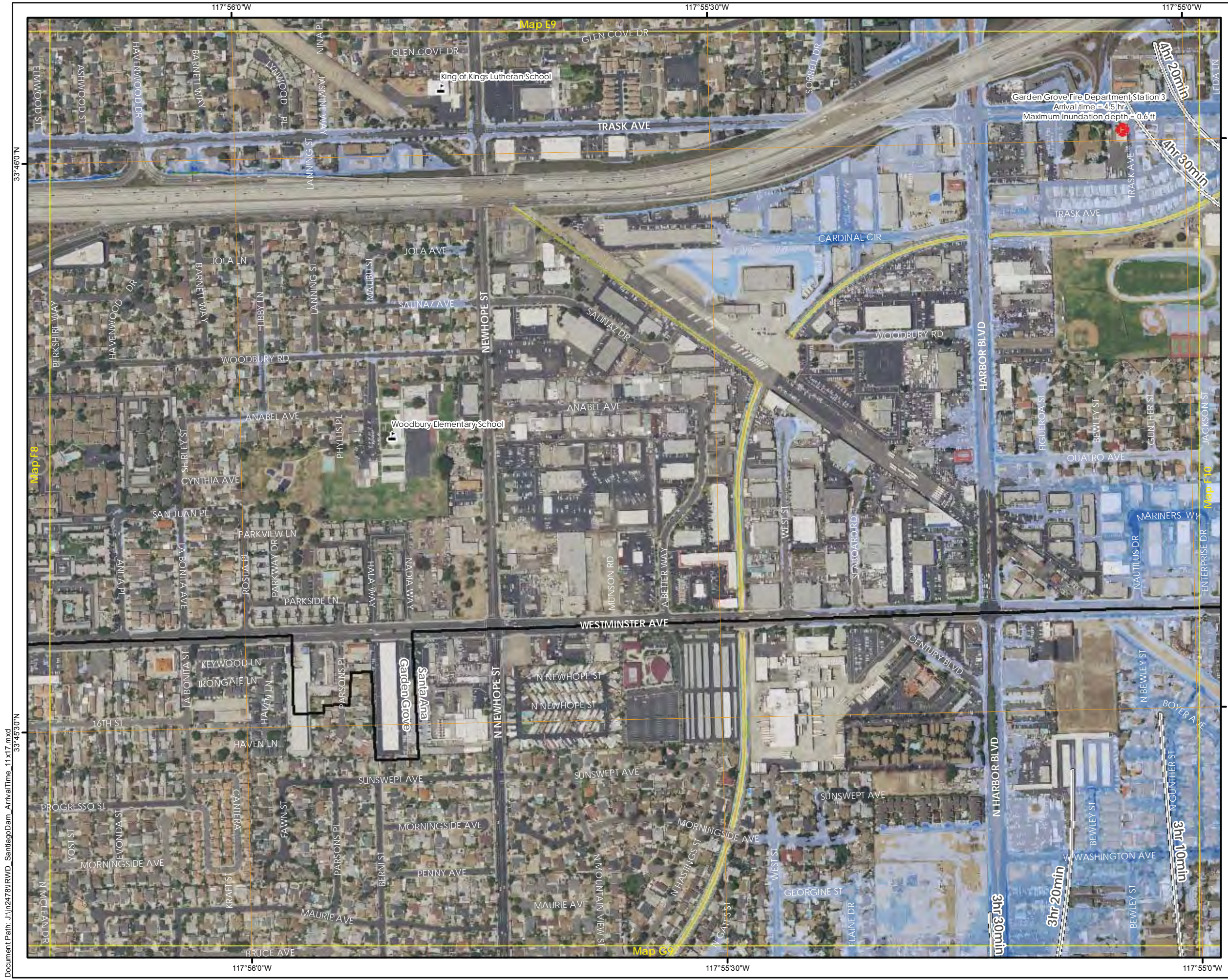
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Expiration Date December 31, 2019

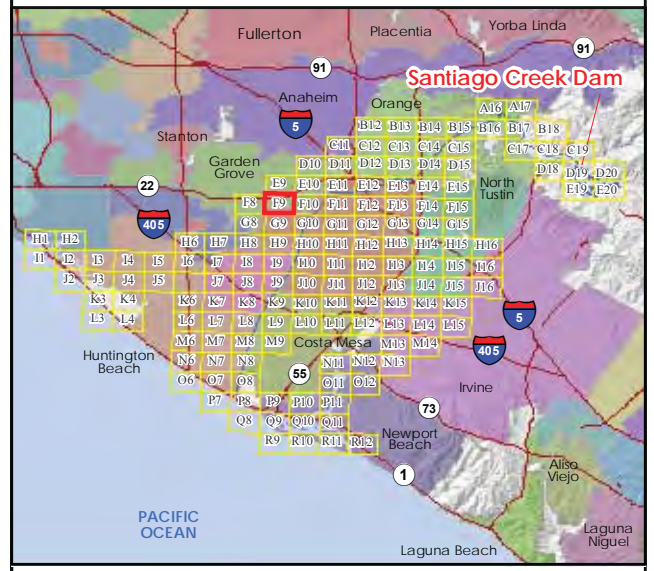
**PANEL 36 of 148**

**F8**

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- F Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

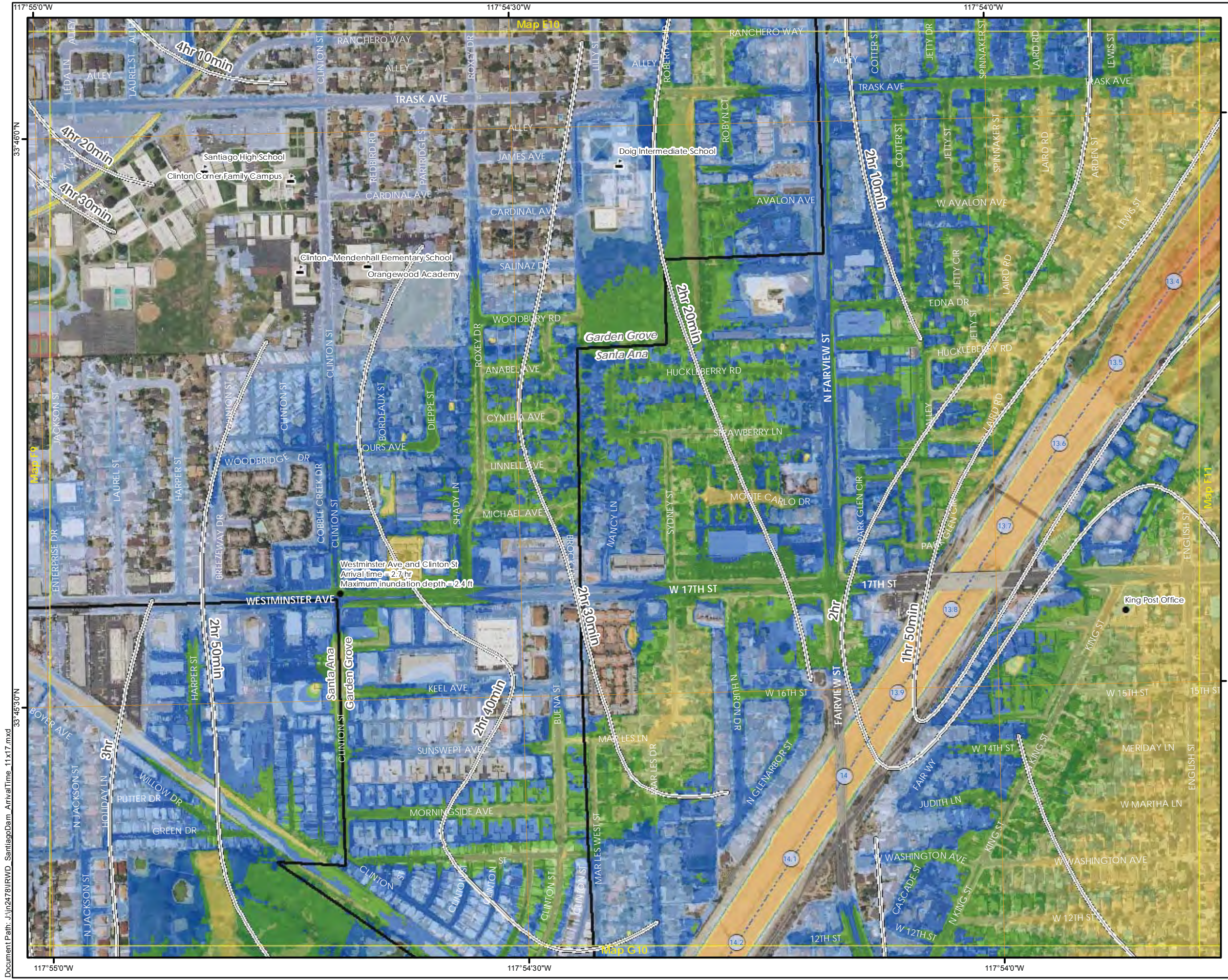
STATE OF CALIFORNIA

**PANEL 37 of 148**

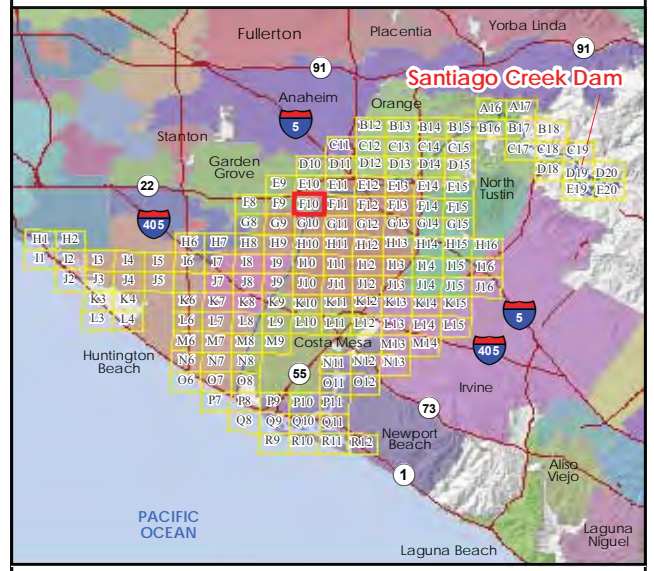
F9

STETSON ENGINEERS INC.





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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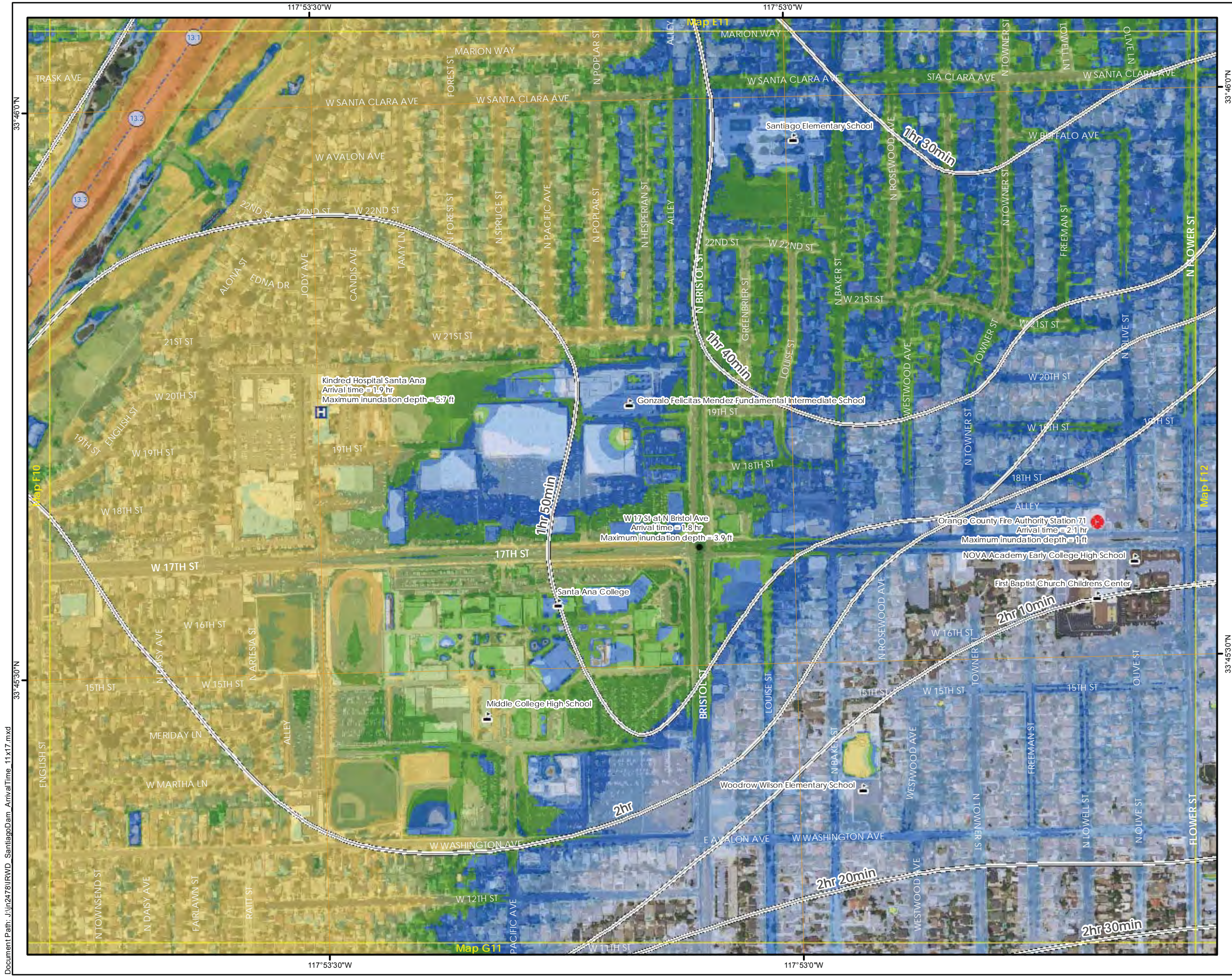
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 38 of 148**

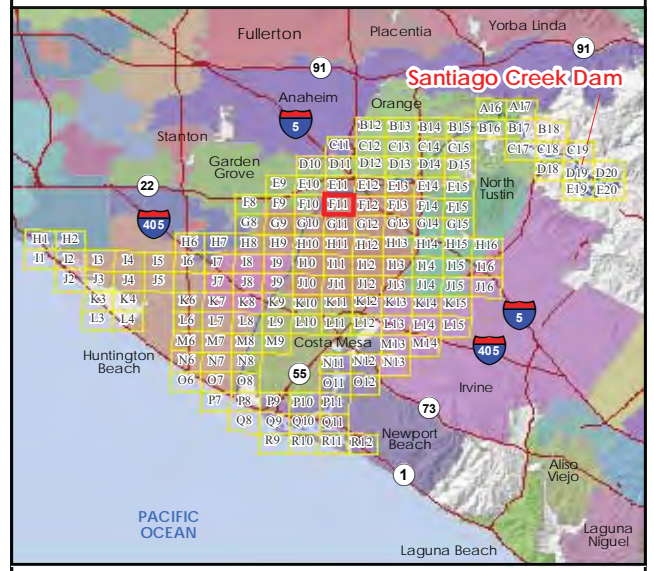
**F10**

**STETSON ENGINEERS INC.**

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**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- S School
- F Fire Station
- H Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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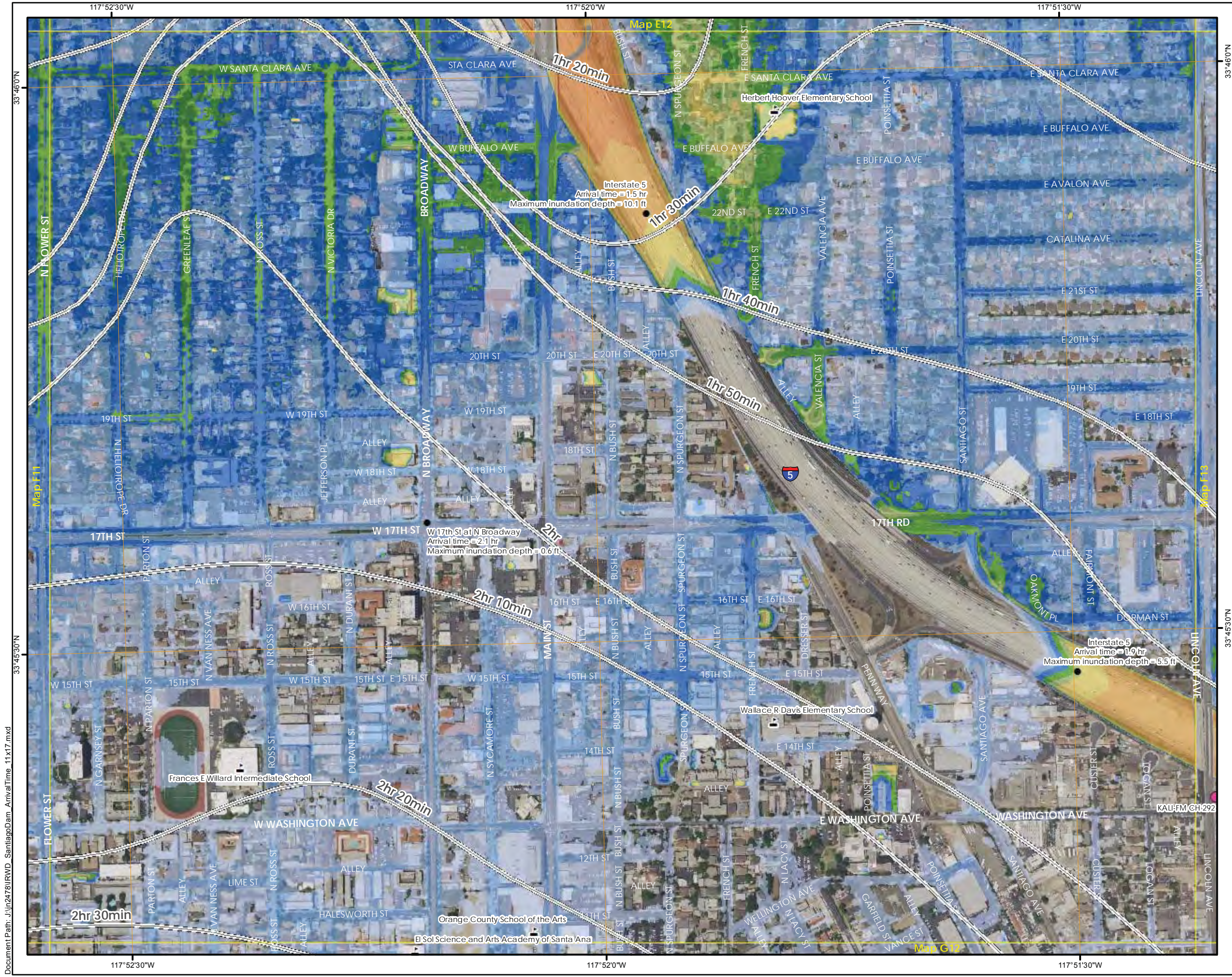
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 39 of 148

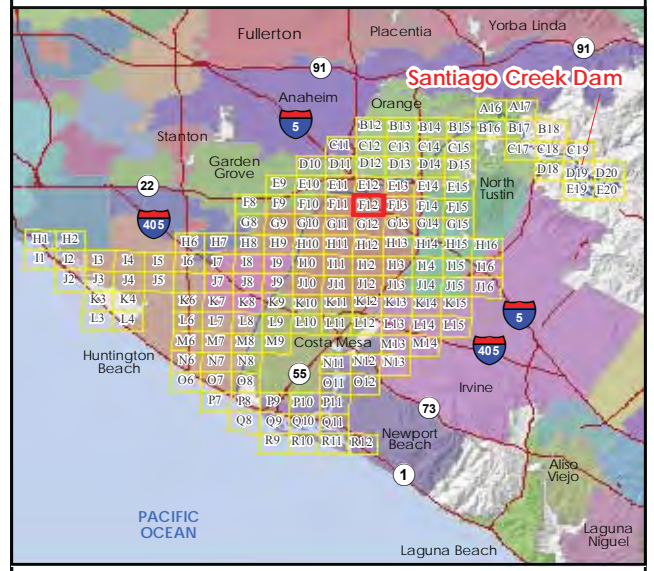
**F11**

0 250 500 750  
Feet

0 100 200  
Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- ▲ School
- Communications Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

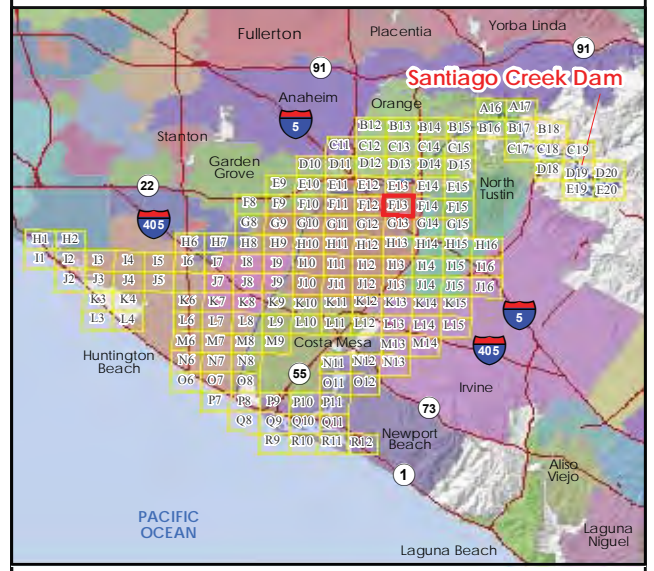
PANEL 40 of 148

F12

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- ▲ School
- Communications Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

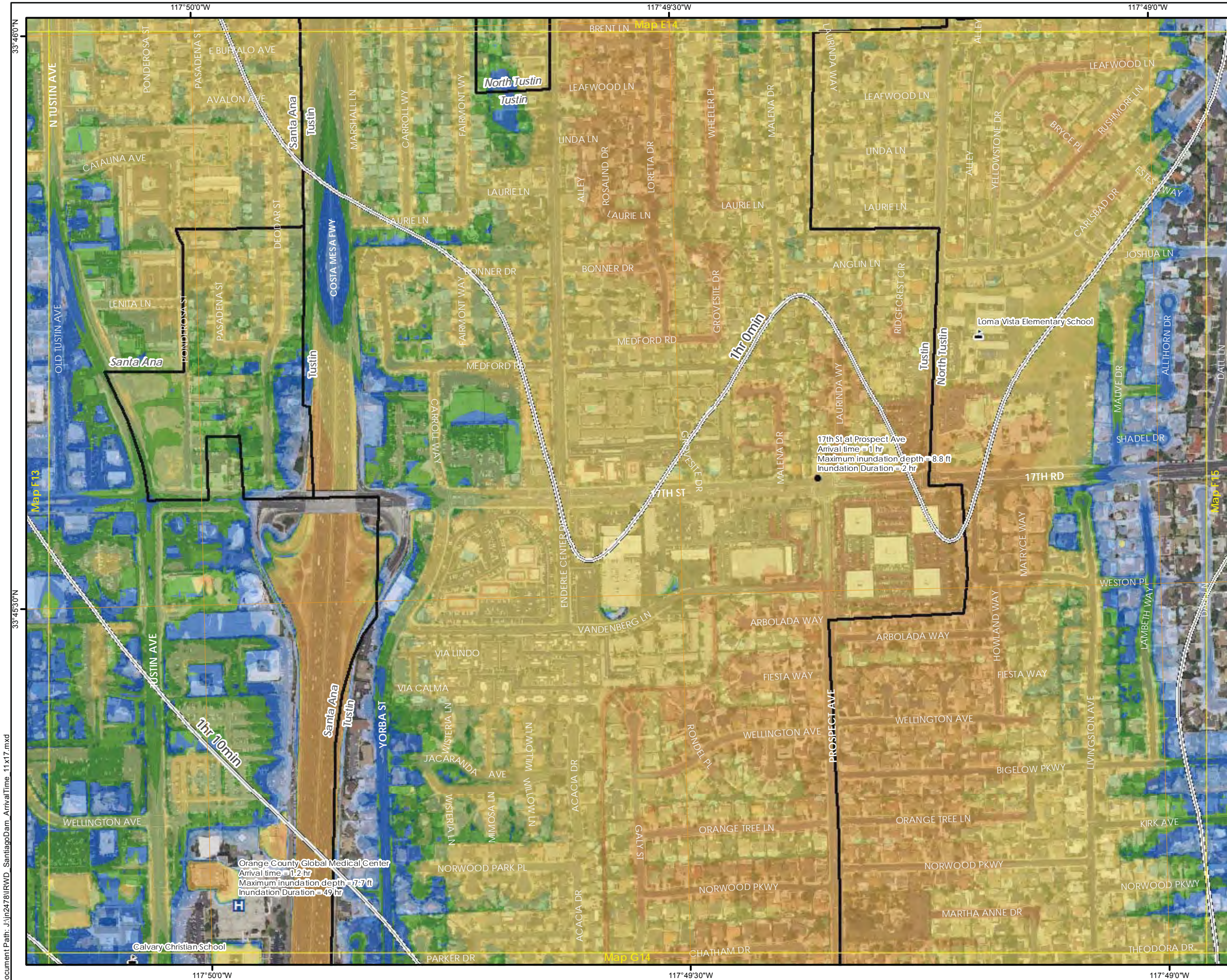
Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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 Expiration Date December 31, 2019

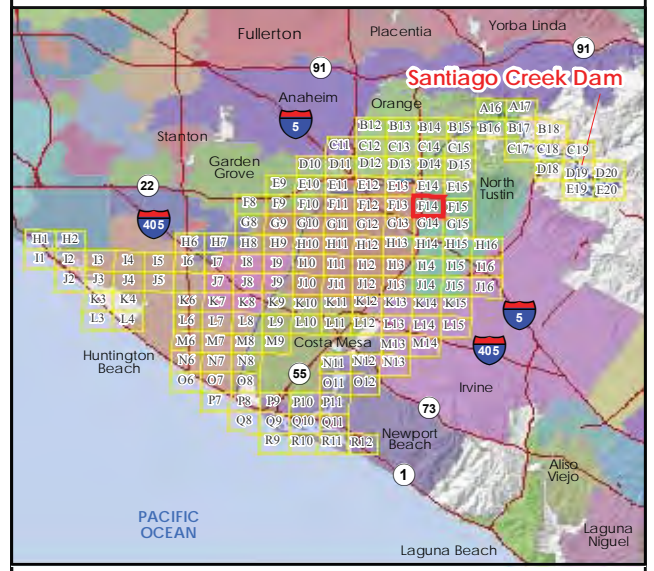
PANEL 41 of 148

**F13**



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
 NATIONAL DAM NO. CA00298  
 ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

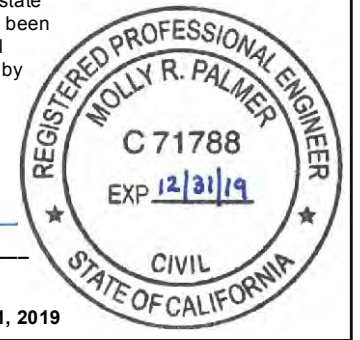
- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*



**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

PANEL 42 of 148

**F14**

**STETSON ENGINEERS INC.**

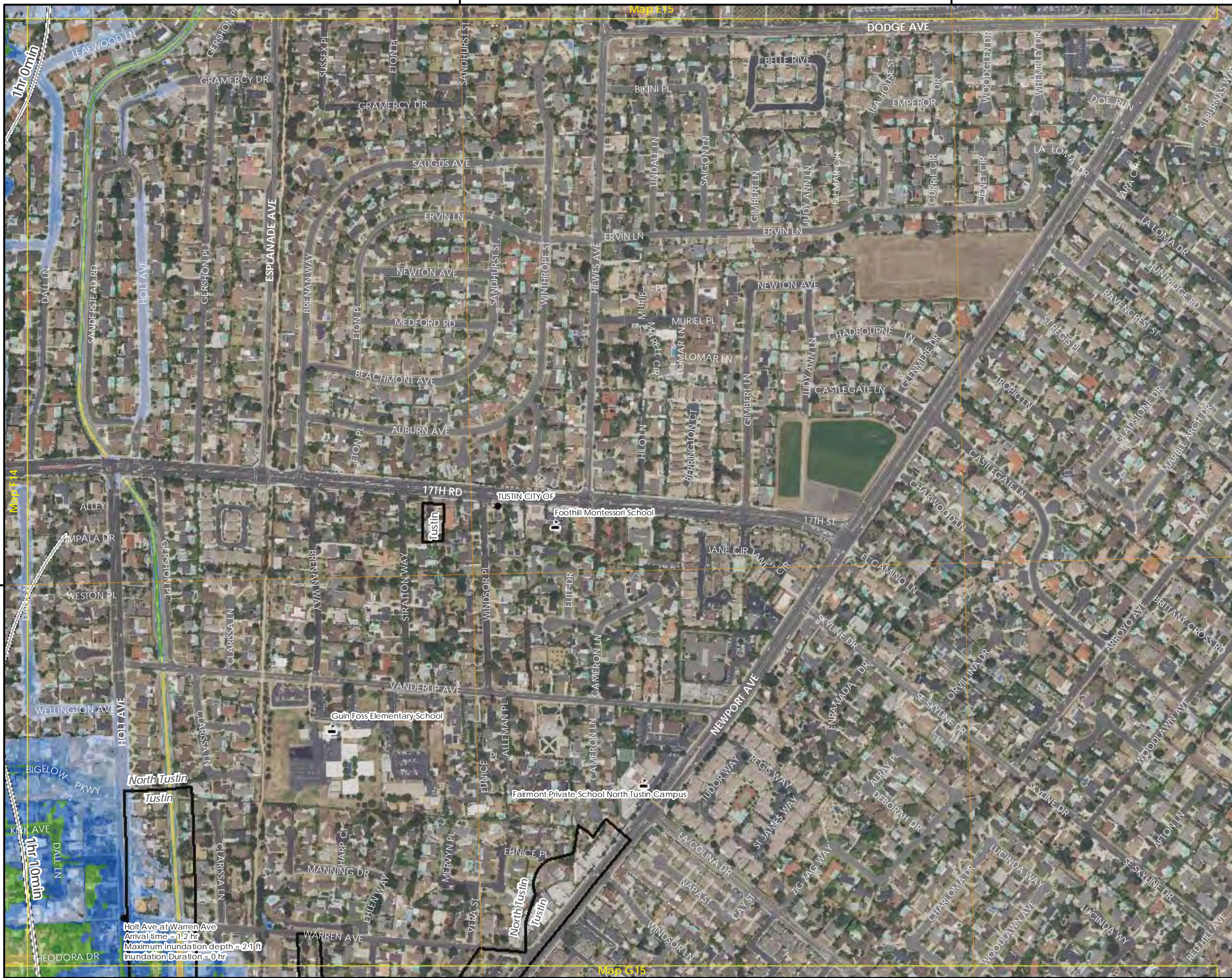
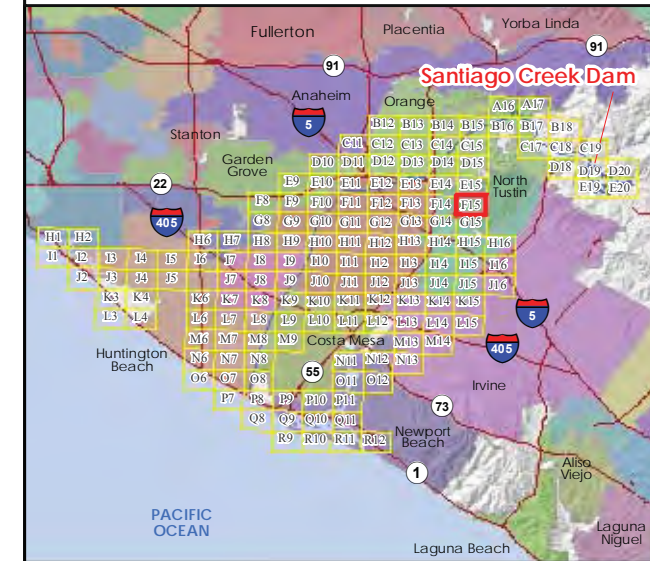
117°48'30"W

117°48'0"W

117°48'30"W

117°48'0"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
  - Dam Crest
  - River
  - Arrival Time
  - City Boundary
  - River Mile
  - School
- | Maximum Inundation Depth, Sunny Day Failure  |          |
|--|----------|
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #e0f0ff; border: 1px solid black; margin-right: 5px;"></span> | 0-1 ft   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #c0e0ff; border: 1px solid black; margin-right: 5px;"></span> | 1-2 ft   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #a0c0ff; border: 1px solid black; margin-right: 5px;"></span> | 2-3 ft   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #80a0ff; border: 1px solid black; margin-right: 5px;"></span> | 3-4 ft   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #6080ff; border: 1px solid black; margin-right: 5px;"></span> | 4-5 ft   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #4060ff; border: 1px solid black; margin-right: 5px;"></span> | 5-10 ft  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #2040ff; border: 1px solid black; margin-right: 5px;"></span> | 10-20 ft |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #0020ff; border: 1px solid black; margin-right: 5px;"></span> | 20-30 ft |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ff0000; border: 1px solid black; margin-right: 5px;"></span> | 30-40 ft |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ff00ff; border: 1px solid black; margin-right: 5px;"></span> | >40 ft   |

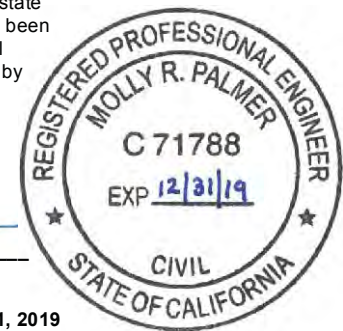
1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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*Molly Palmer*

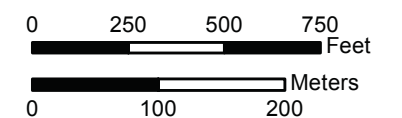
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



PANEL 43 of 148

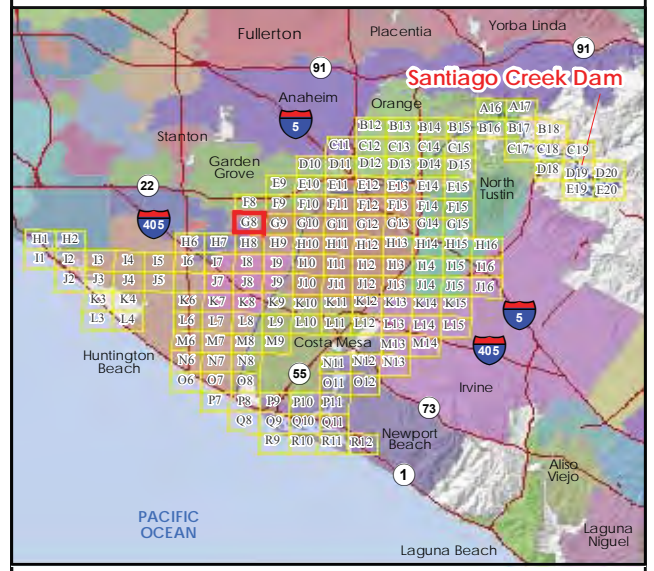


F15





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

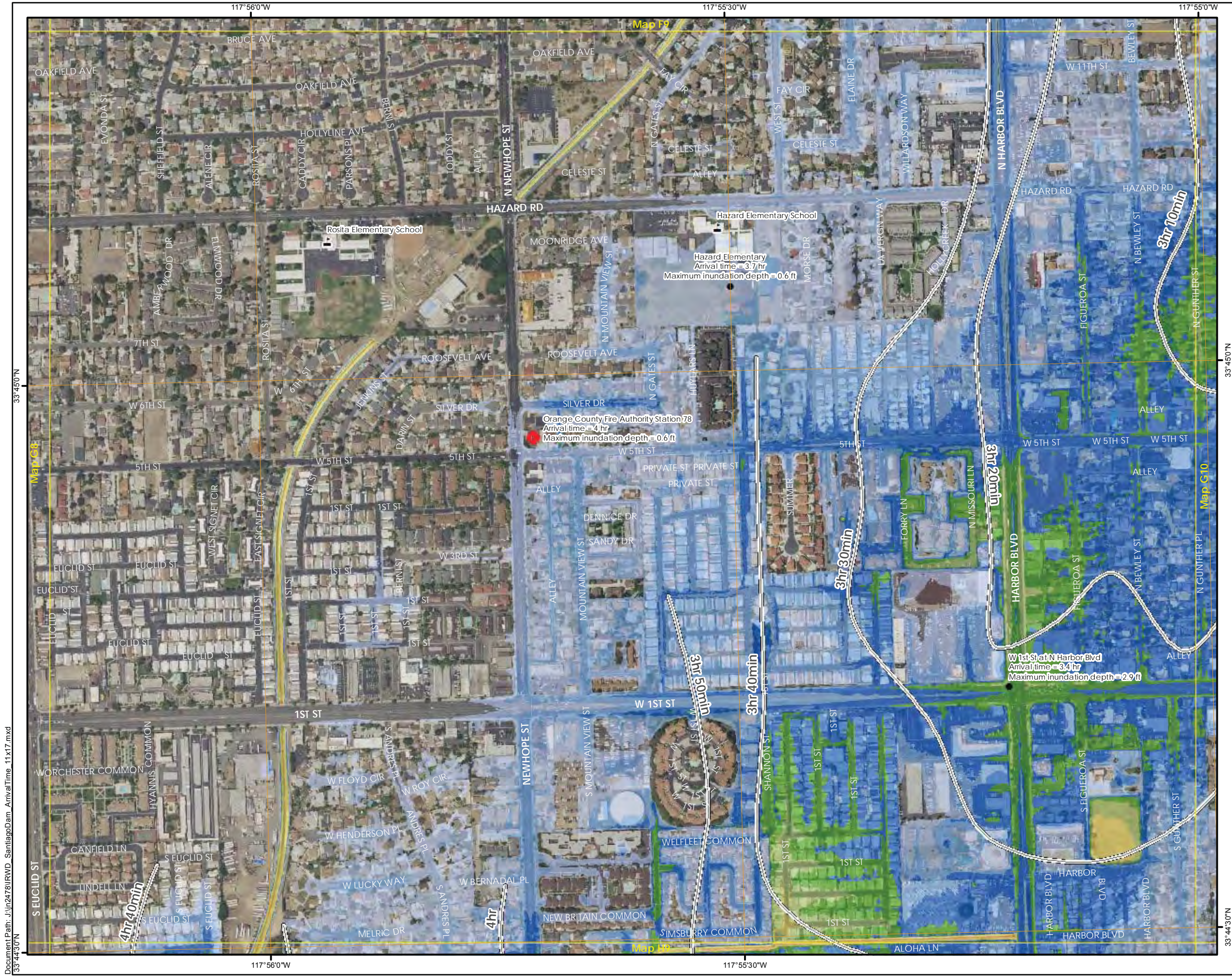
PANEL 44 of 148

STETSON ENGINEERS INC.

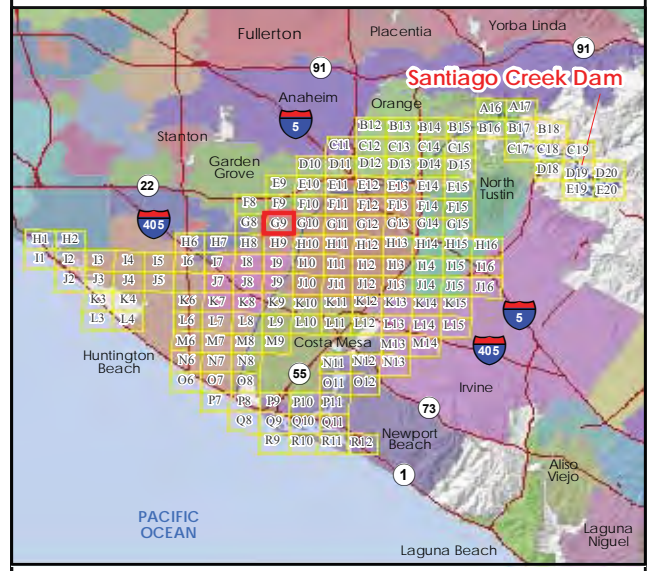
0 250 500 750 Feet

0 100 200 Meters

G8



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 45 of 148**

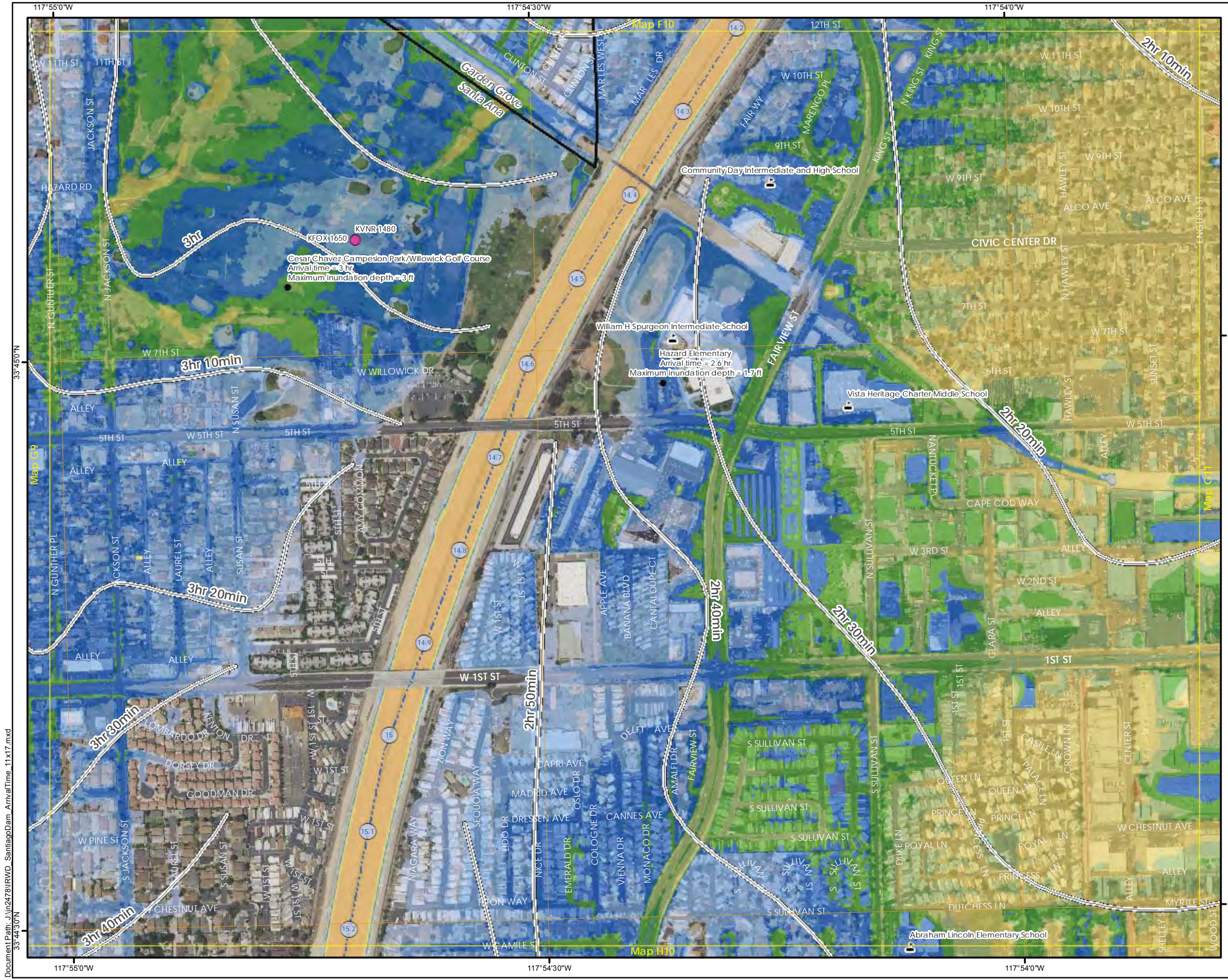
**STETSON**  
ENGINEERS INC.

N

**G9**

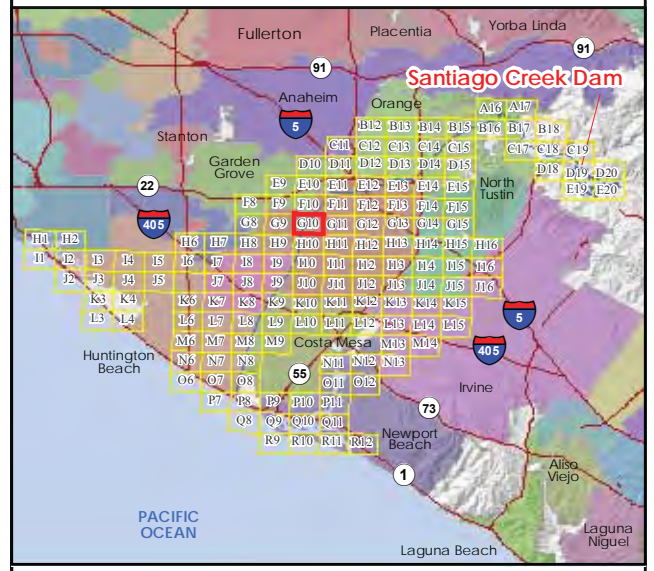
0 250 500 750 Feet  
0 100 200 Meters





# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Communications Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

PANEL 46 of 148

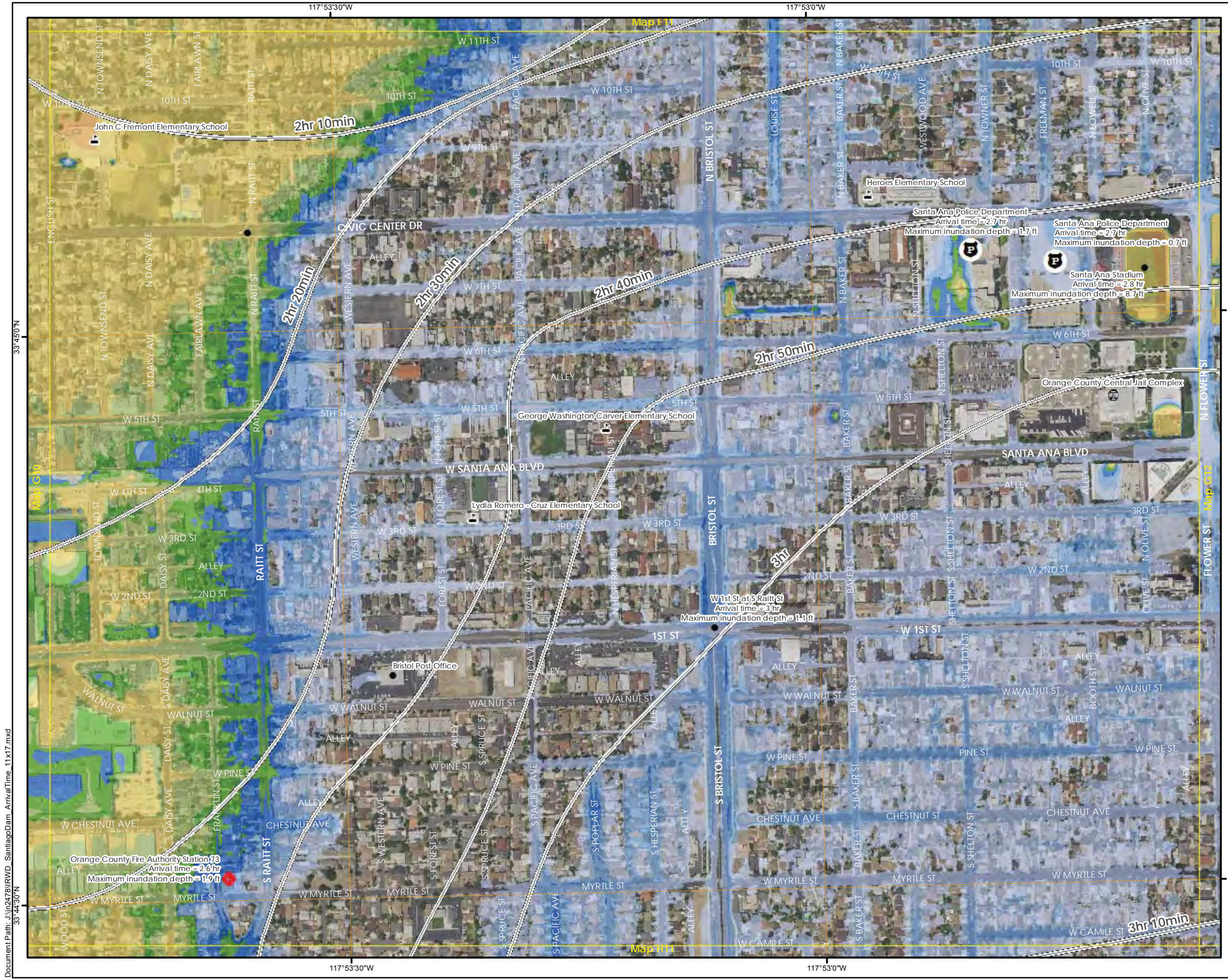
**G10**

STETSON ENGINEERS INC.

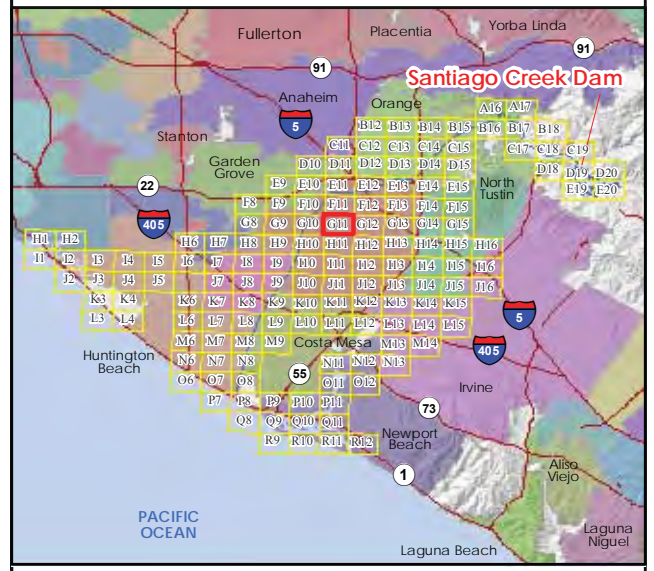
0 250 500 750 Feet

0 100 200 Meters

N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station
- Police Station
- Correctional Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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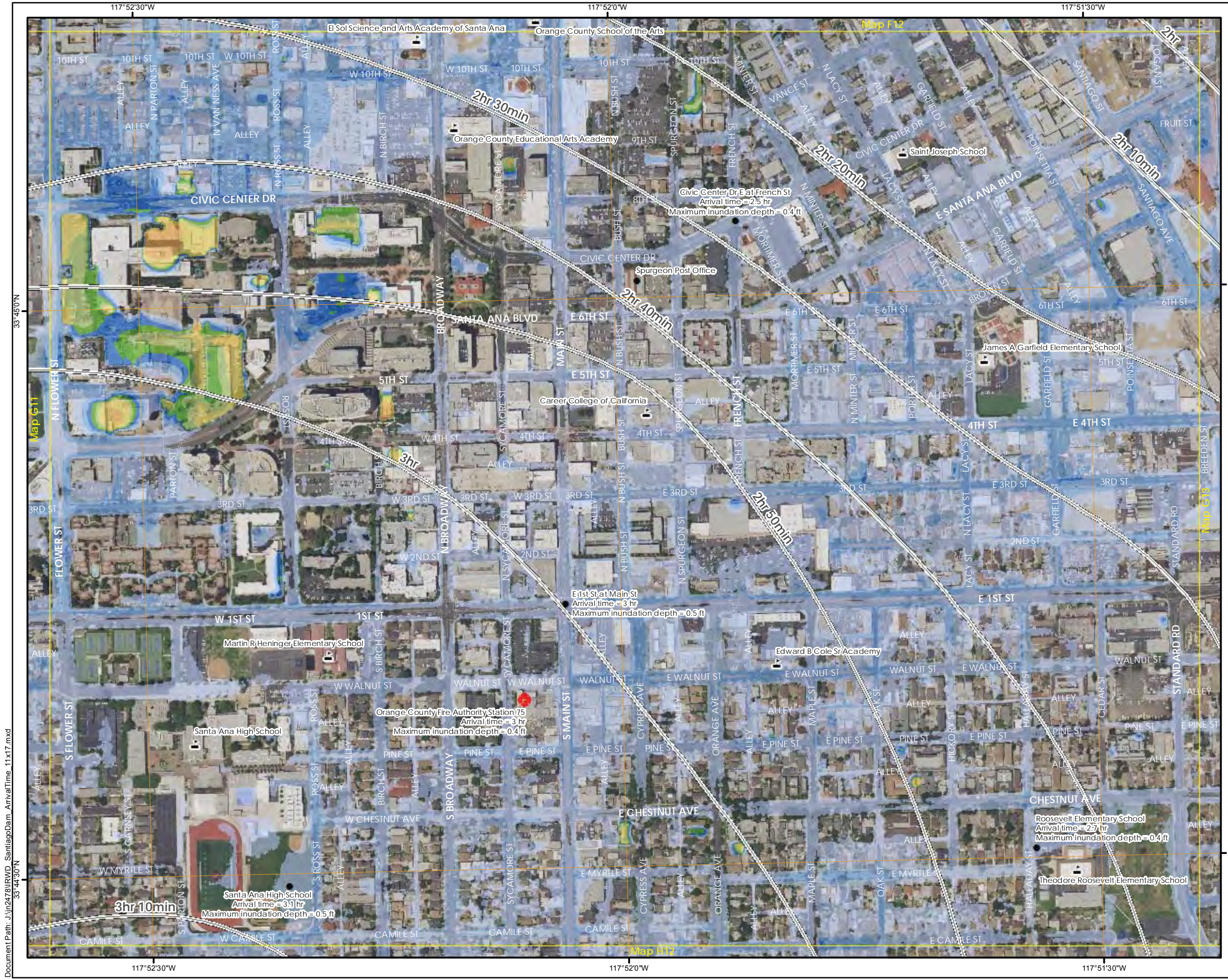
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

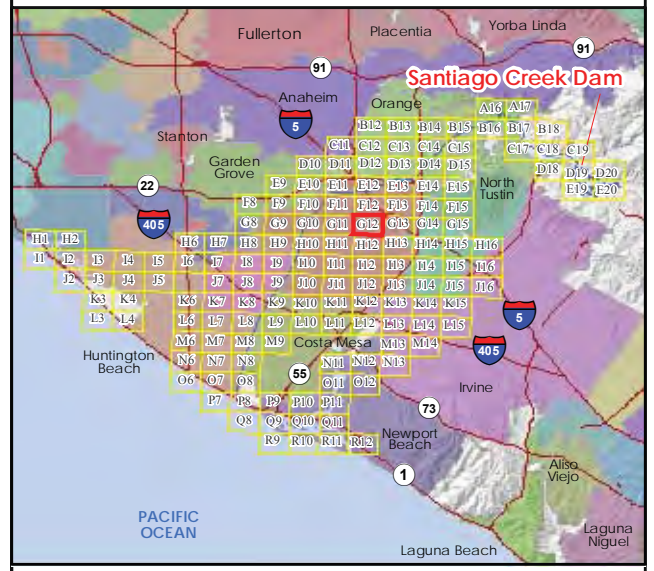
PANEL 47 of 148

**G11**

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station


**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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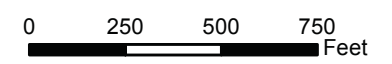
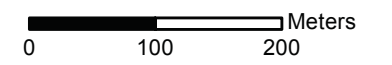
  
**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

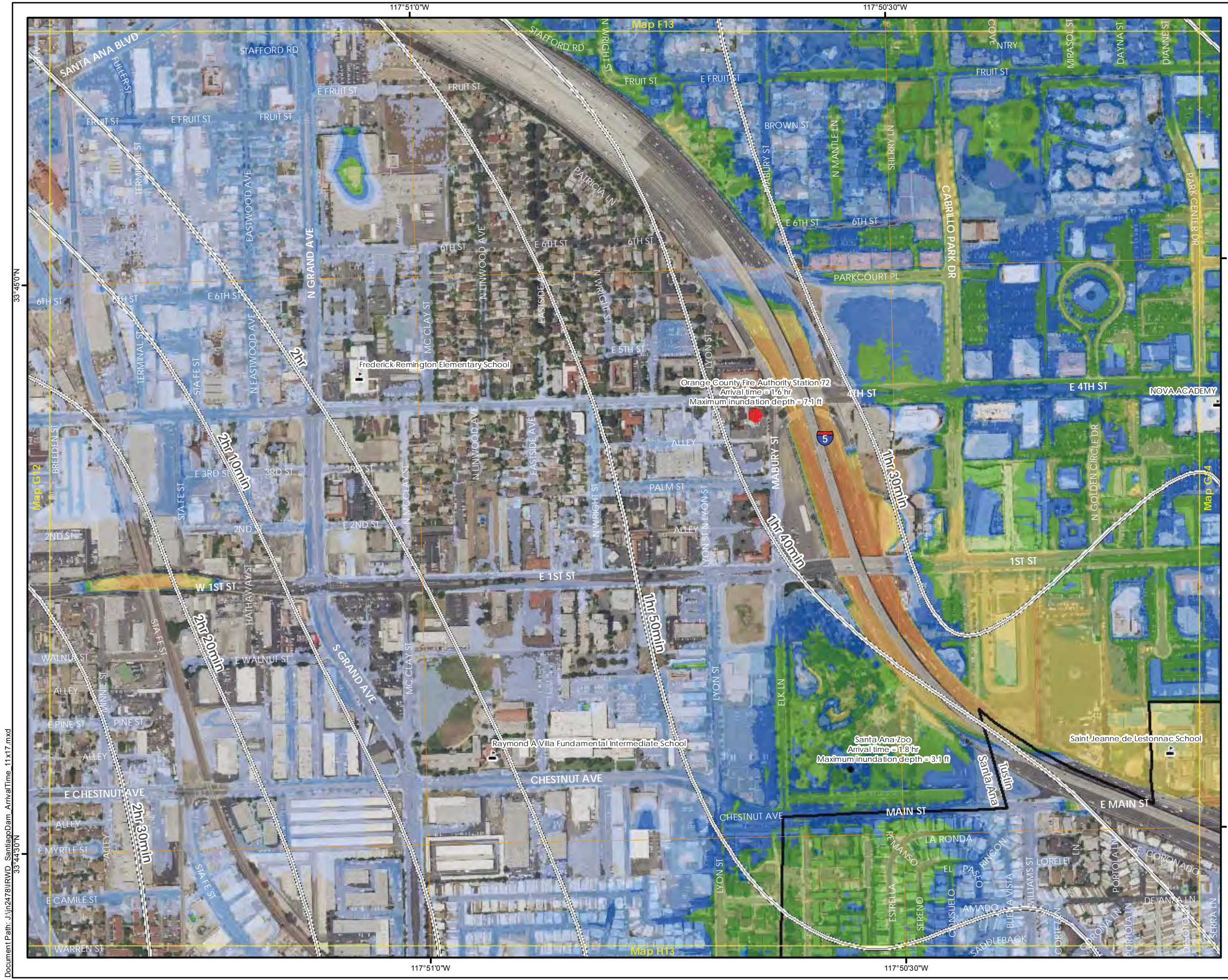
REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

PANEL 48 of 148

**G12**

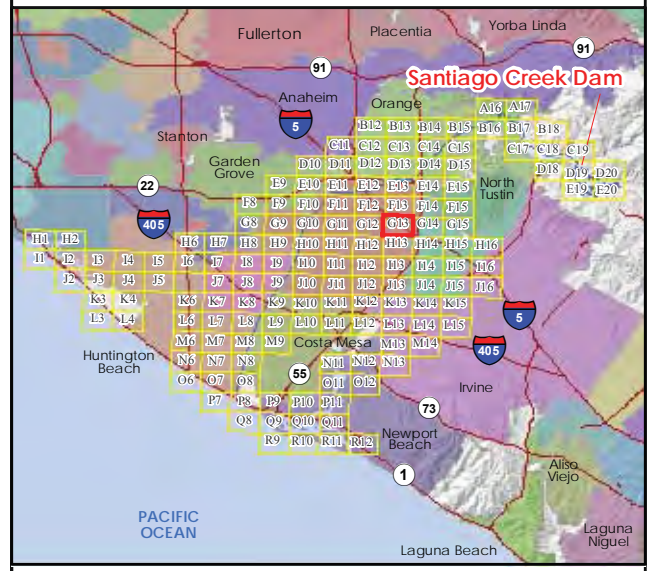




# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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REGISTERED PROFESSIONAL ENGINEER  
 MOLLY R. PALMER  
 C 71788  
 EXP 12/31/19  
 CIVIL  
 STATE OF CALIFORNIA

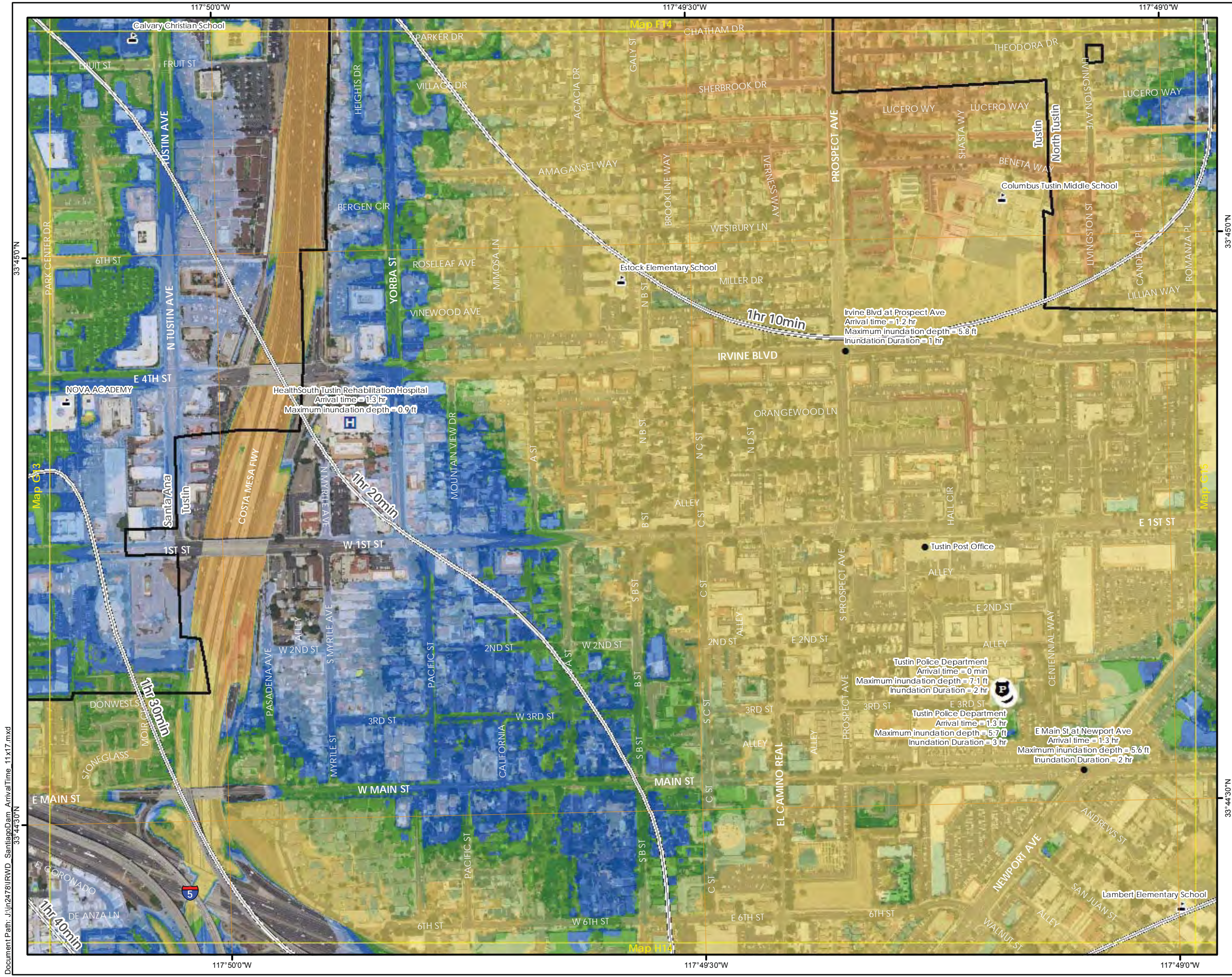
Molly Palmer,  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

PANEL 49 of 148

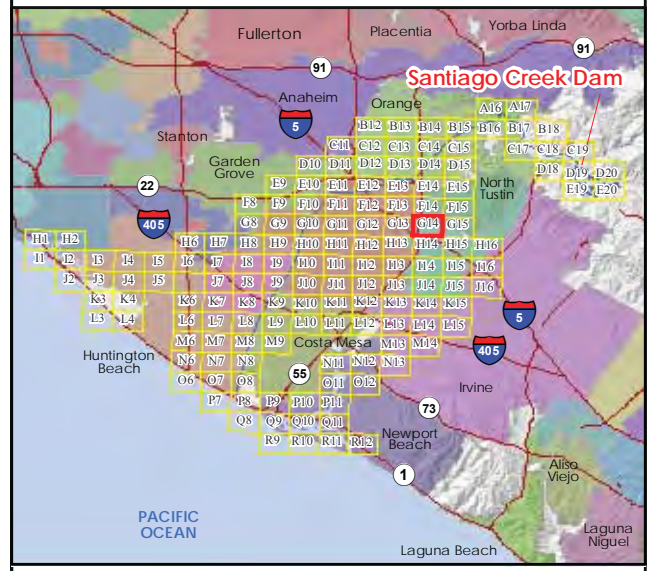
**G13**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Police Station
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

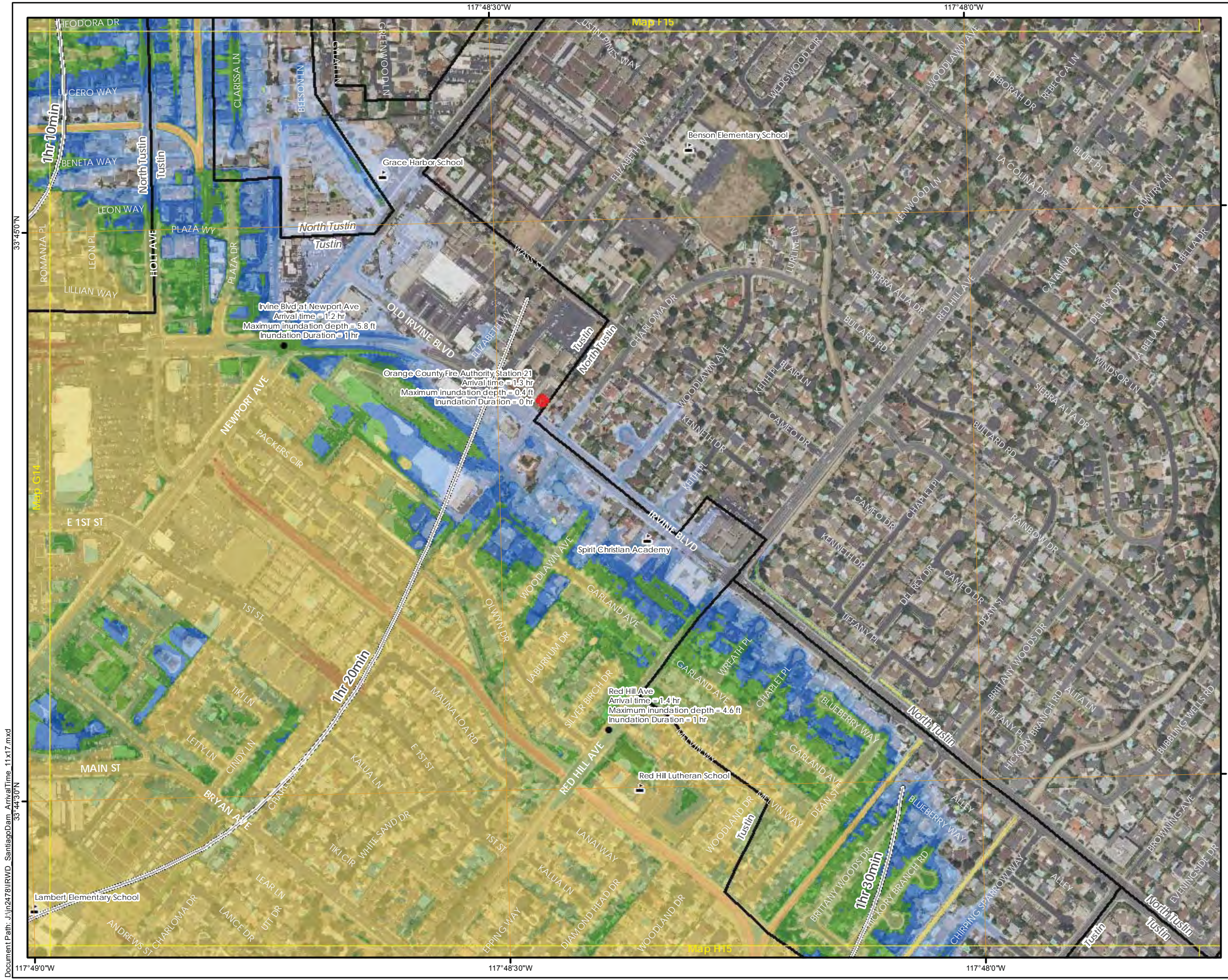
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*

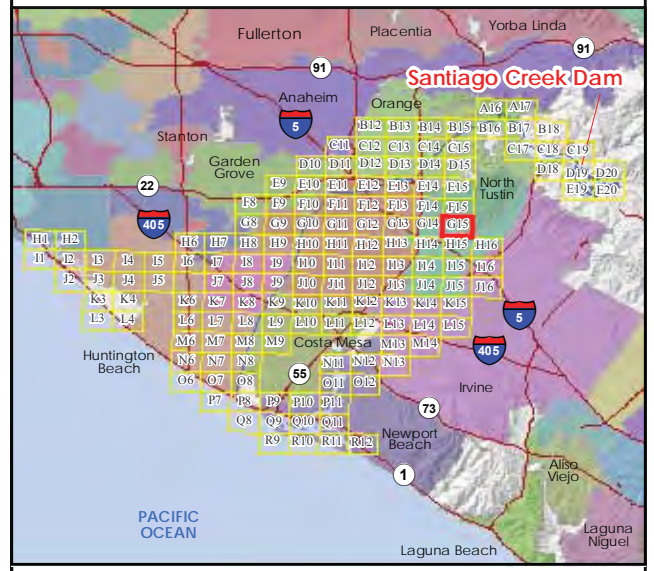
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 50 of 148

**G14**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 51 of 148**

**G15**

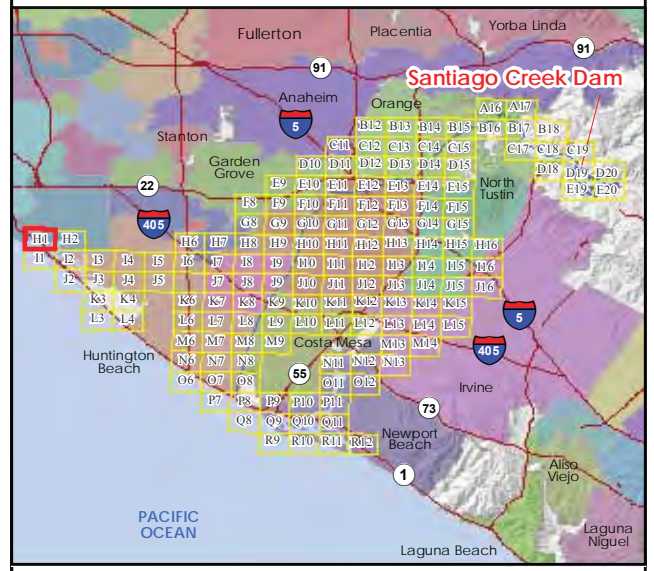
N

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Trail Head


**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft


1/26/2018

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Expiration Date December 31, 2019



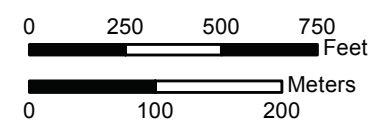
**PANEL 52 of 148**



N

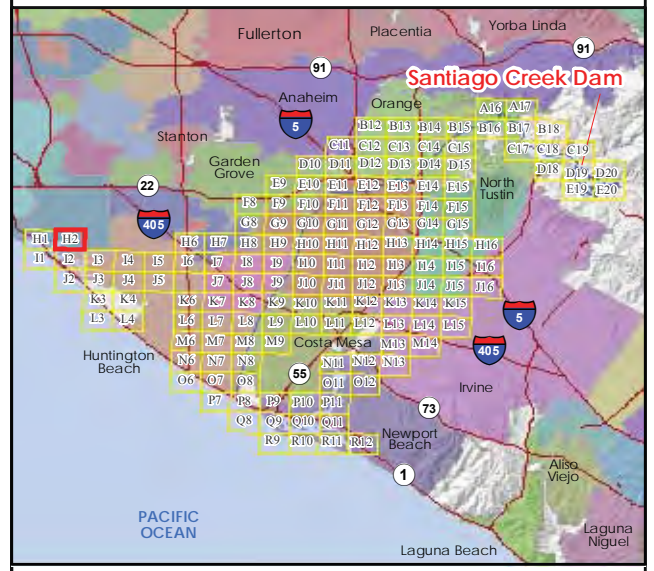


**H1**





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 53 of 148**

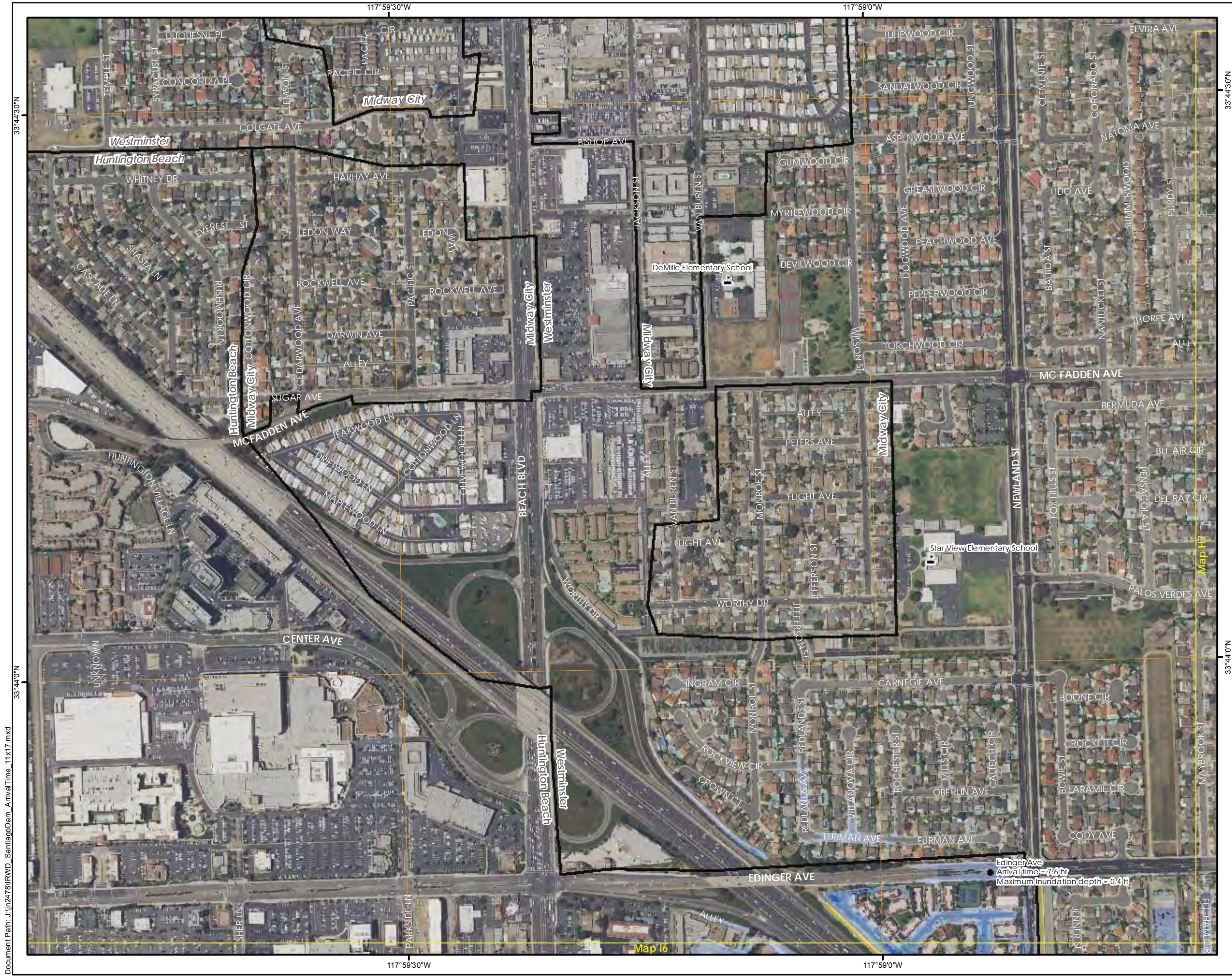
**H2**

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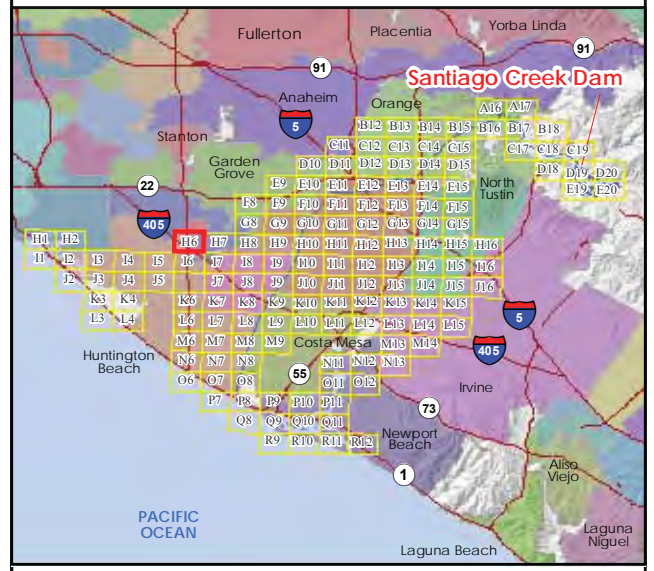
0 250 500 750 Feet

0 100 200 Meters





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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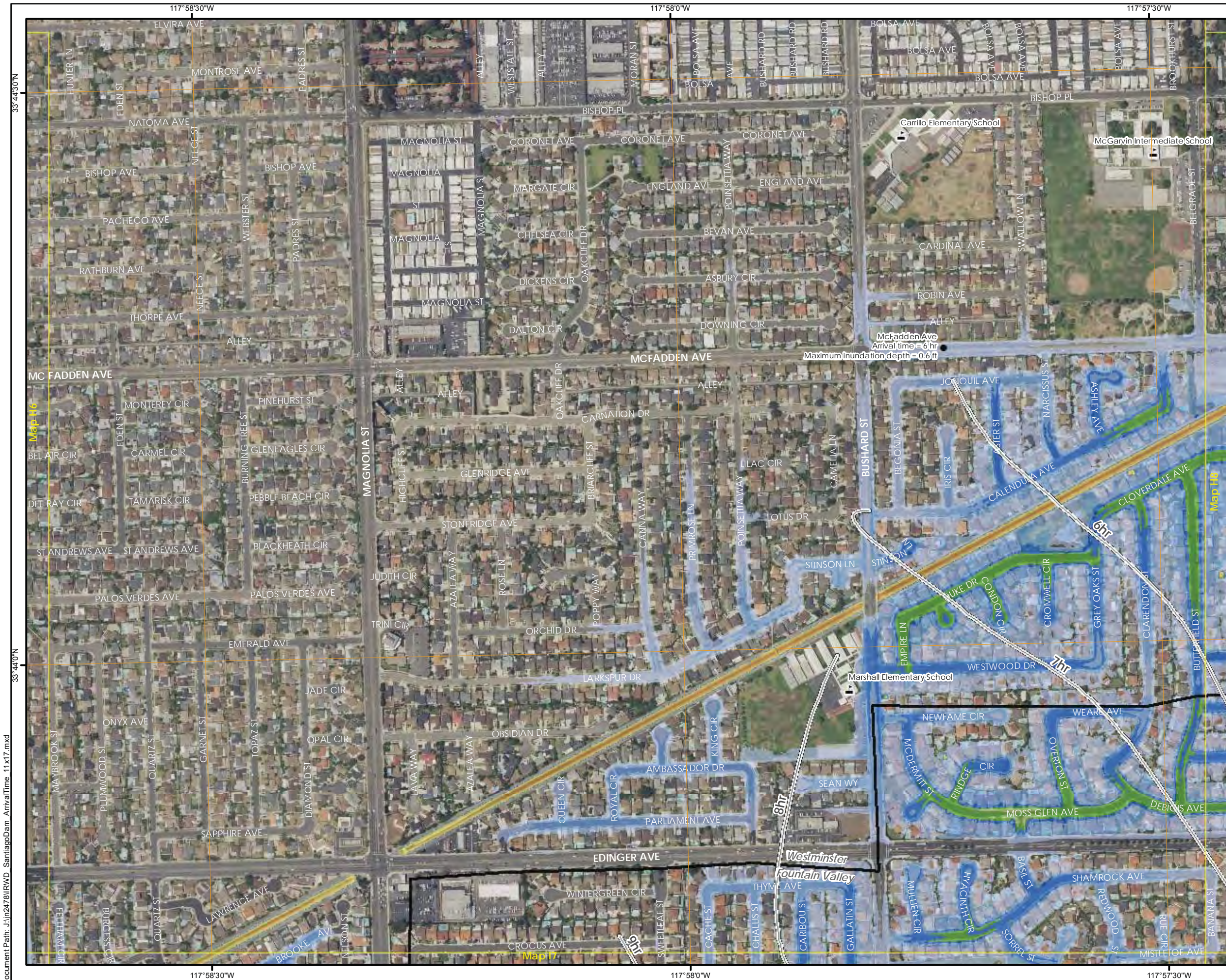
**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

**PANEL 54 of 148**

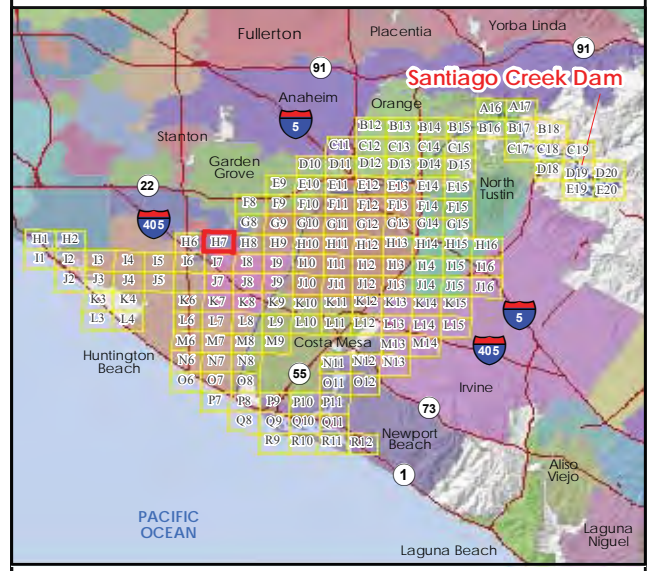
**H6**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**REGISTERED PROFESSIONAL ENGINEER**  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 55 of 148

**STETSON ENGINEERS INC.**

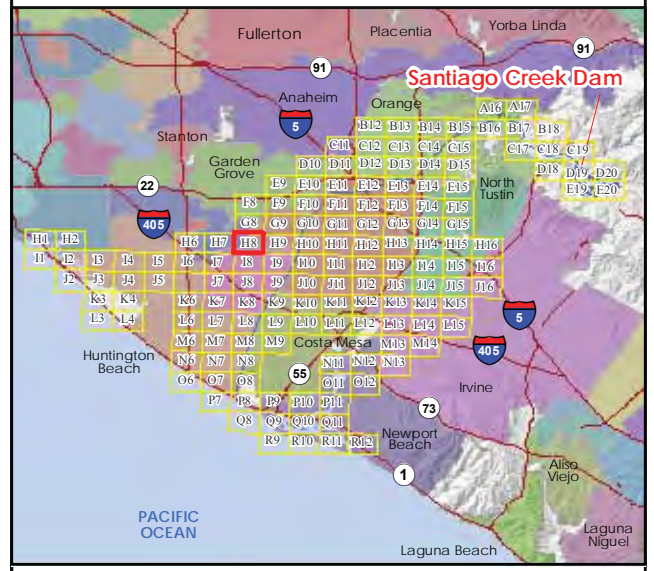
0 250 500 750 Feet  
0 100 200 Meters

**H7**

Document Path: J:\m2478\RW\ SantiagoDam\_ArrivalTime\_11x17.mxd



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

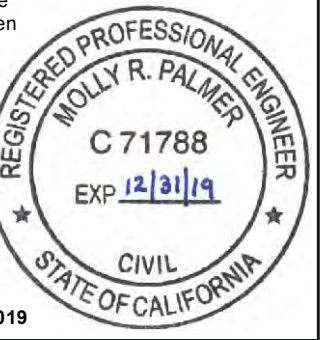
- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*  
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



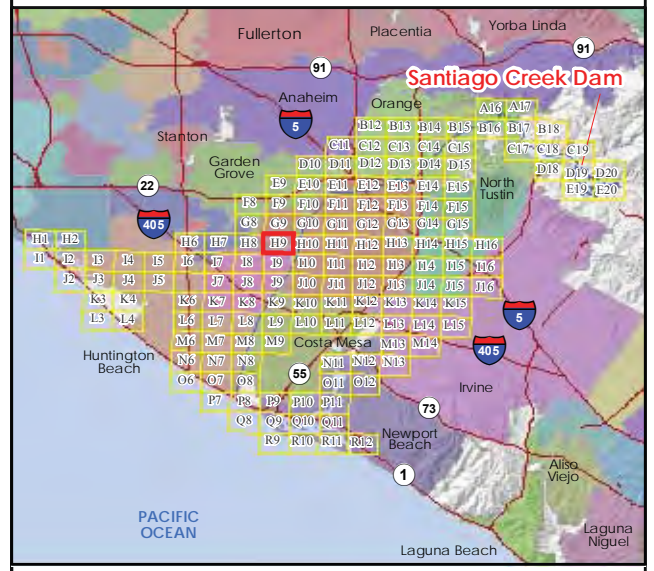
PANEL 56 of 148

**H8**

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

PANEL 57 of 148

N

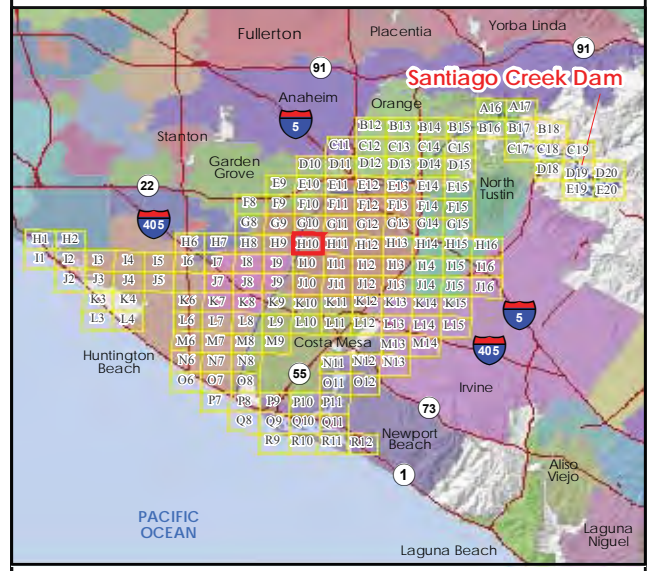
**H9**

0 250 500 750  
Feet

0 100 200  
Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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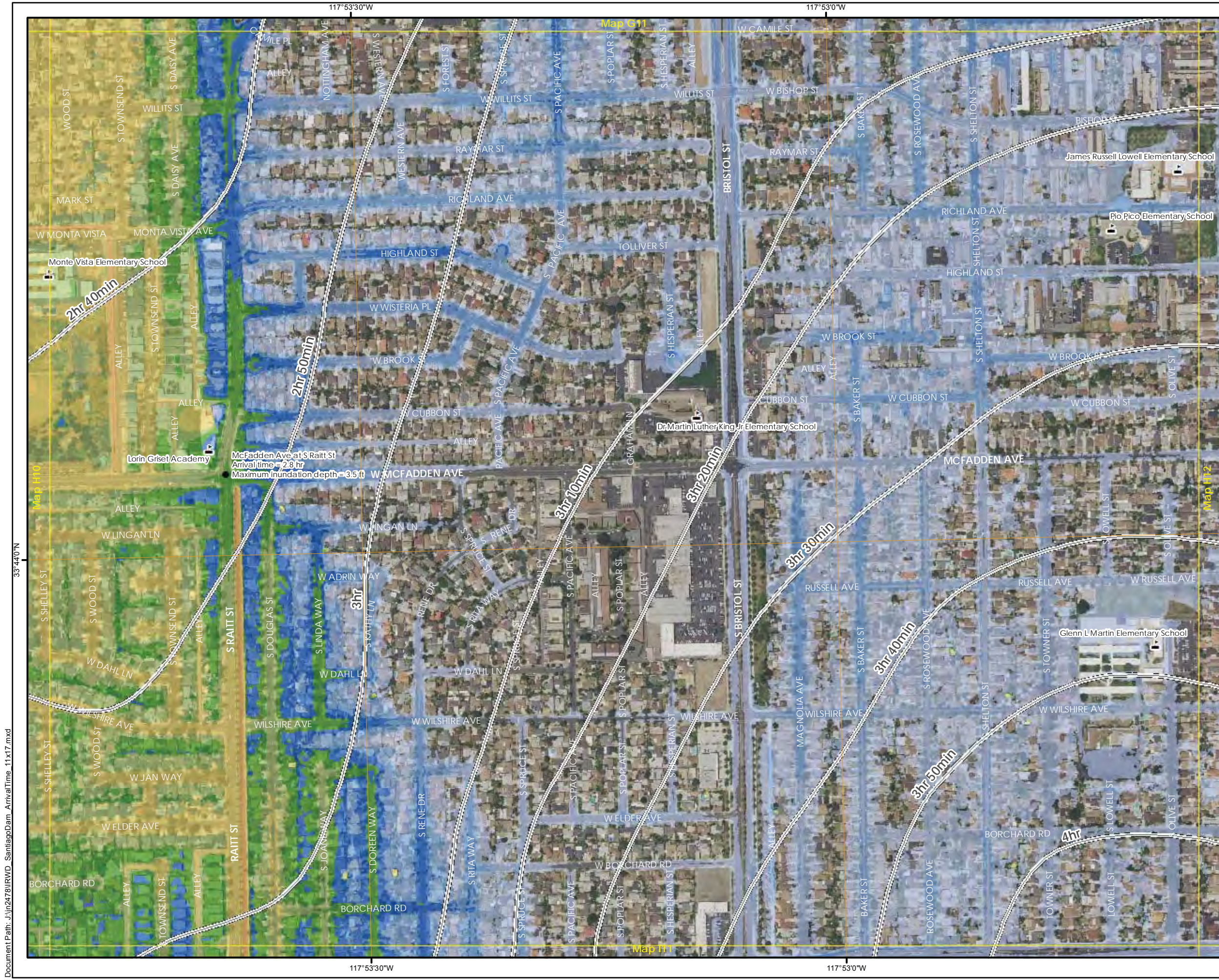
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

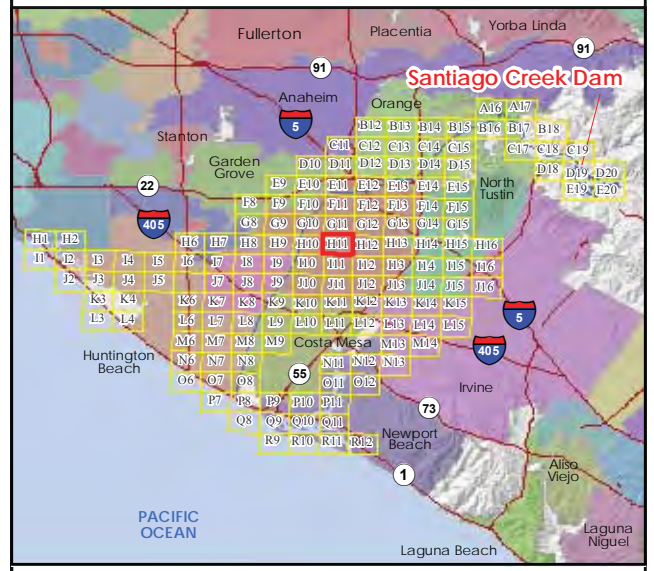
PANEL 58 of 148

**H10**

**STETSON**  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

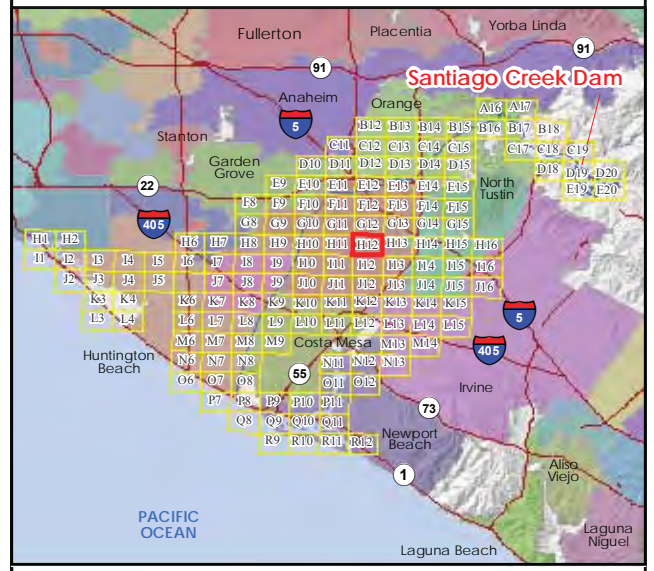
PANEL 59 of 148

N

**H11**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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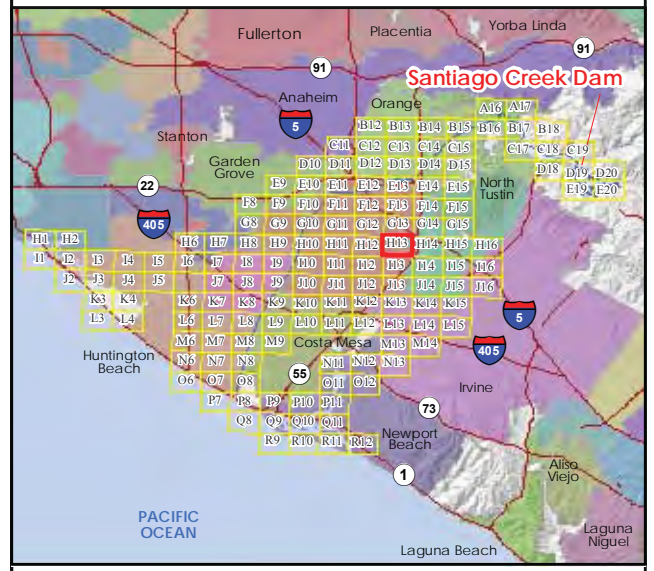
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 60 of 148

**H12**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

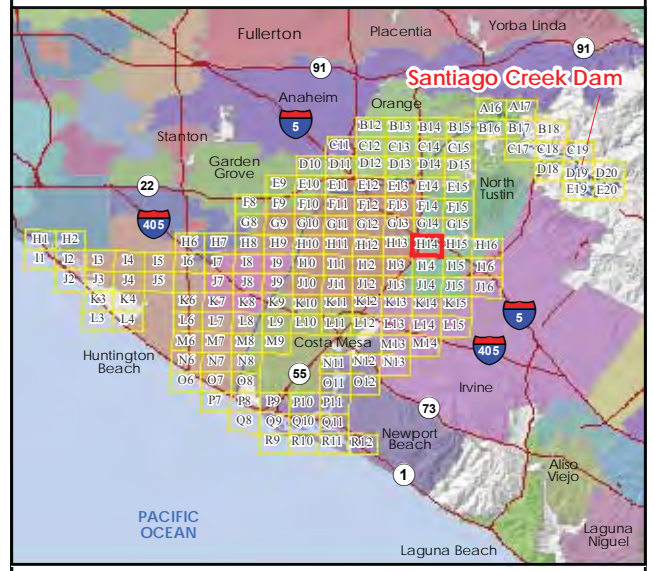
PANEL 61 of 148

**H13**





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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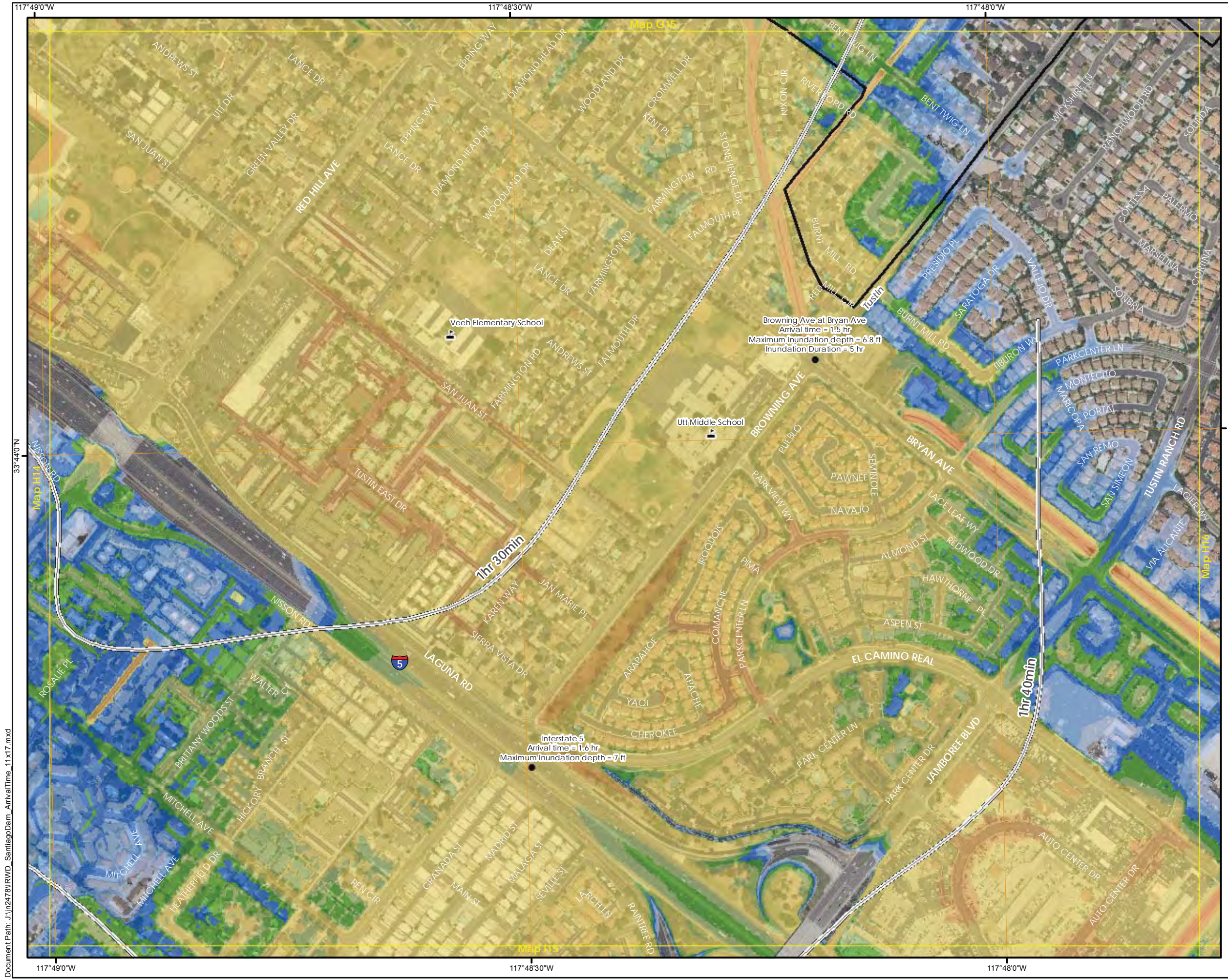
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

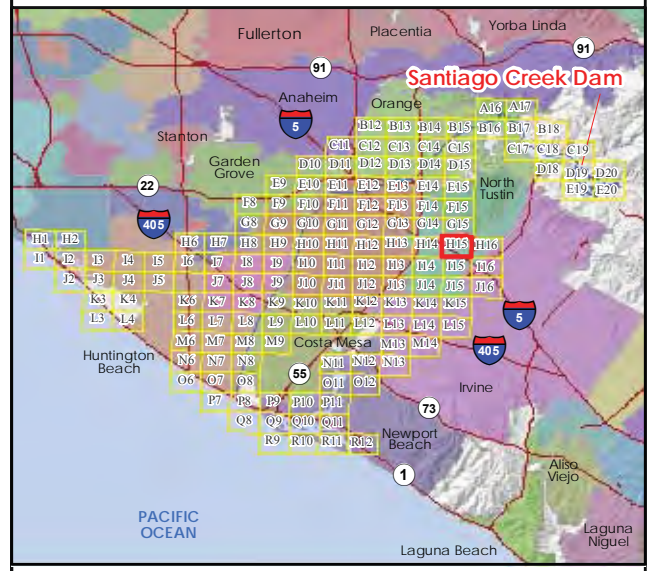
PANEL 62 of 148

**H14**

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

PANEL 63 of 148

N

**H15**

0 250 500 750  
Feet

0 100 200  
Meters

117°47'30"W

117°47'0"W

33°44'0"N

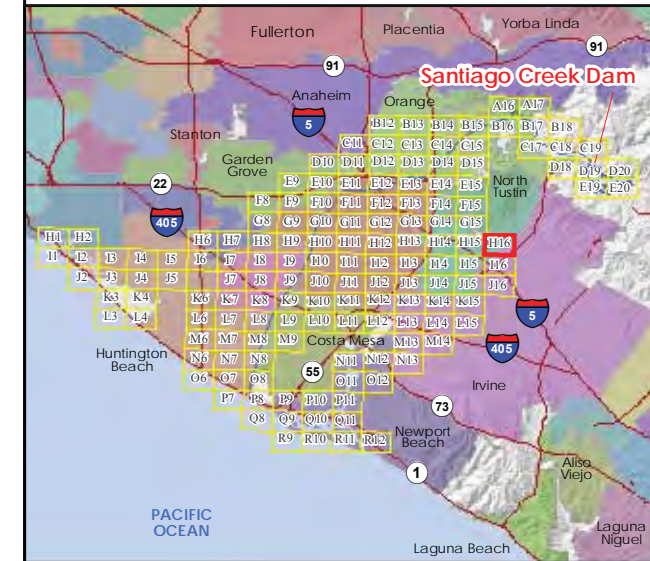
33°44'0"N

Document Path: J:\m2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd

117°47'30"W

117°47'0"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth,  
Sunny Day Failure**

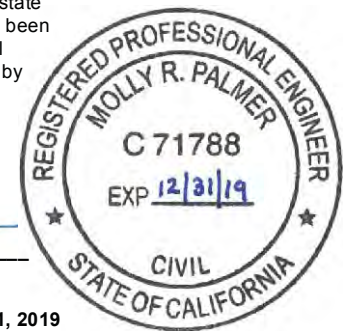
- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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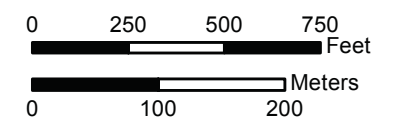
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



PANEL 64 of 148



**H16**



118°5'30"W

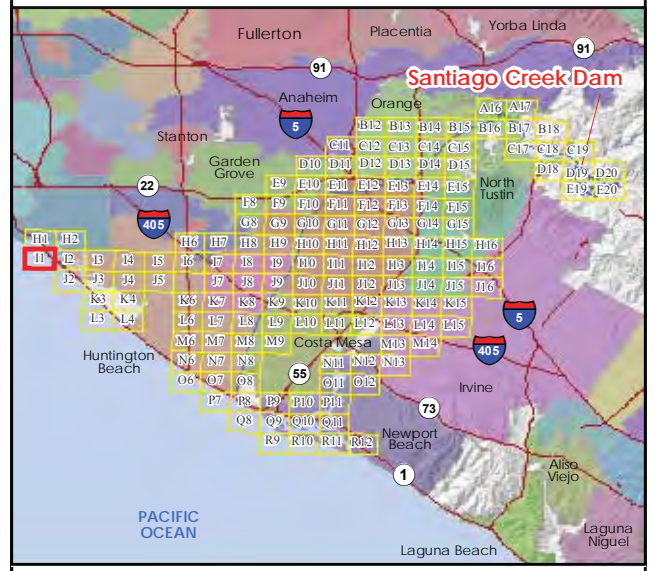
118°5'0"W



118°5'30"W

118°5'0"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

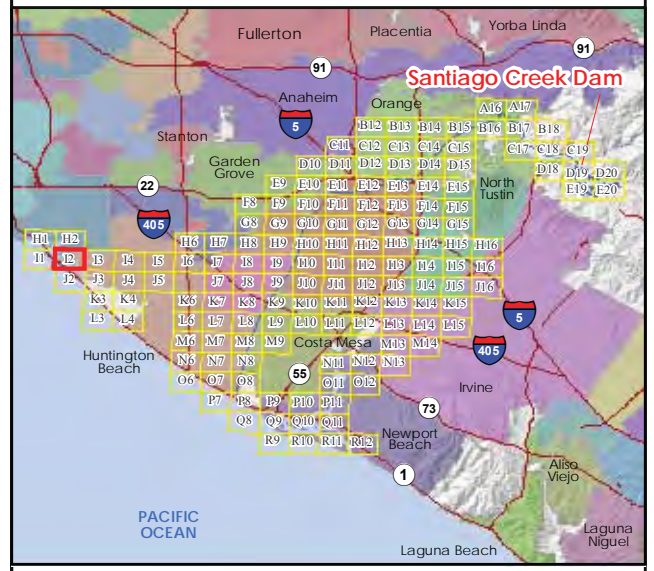
**PANEL 65 of 148**

**I1**

**STETSON**  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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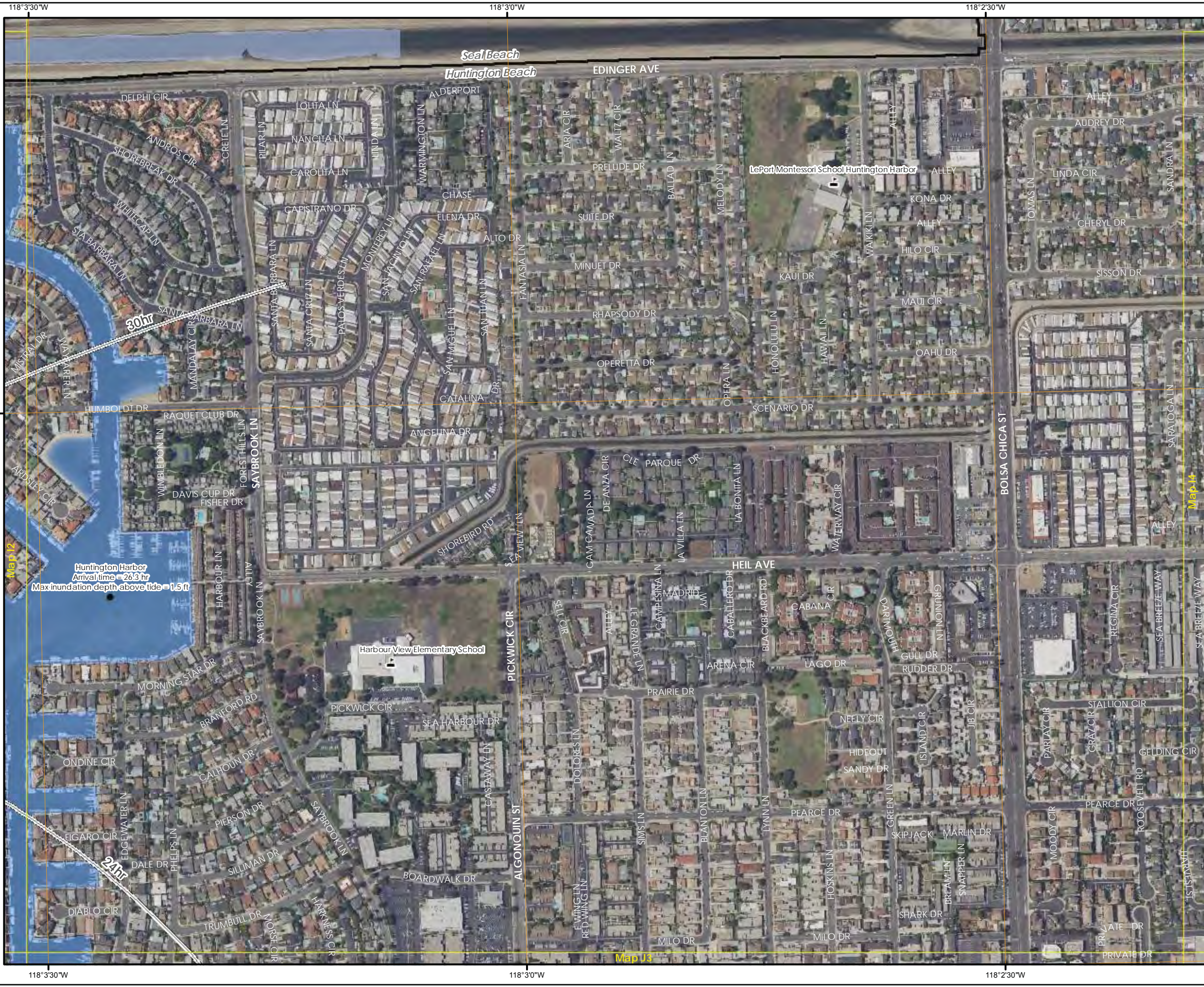
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

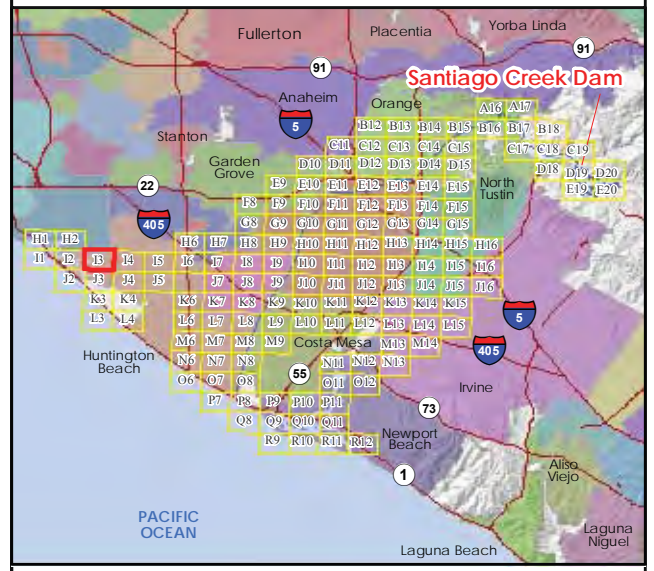
PANEL 66 of 148

**I2**

N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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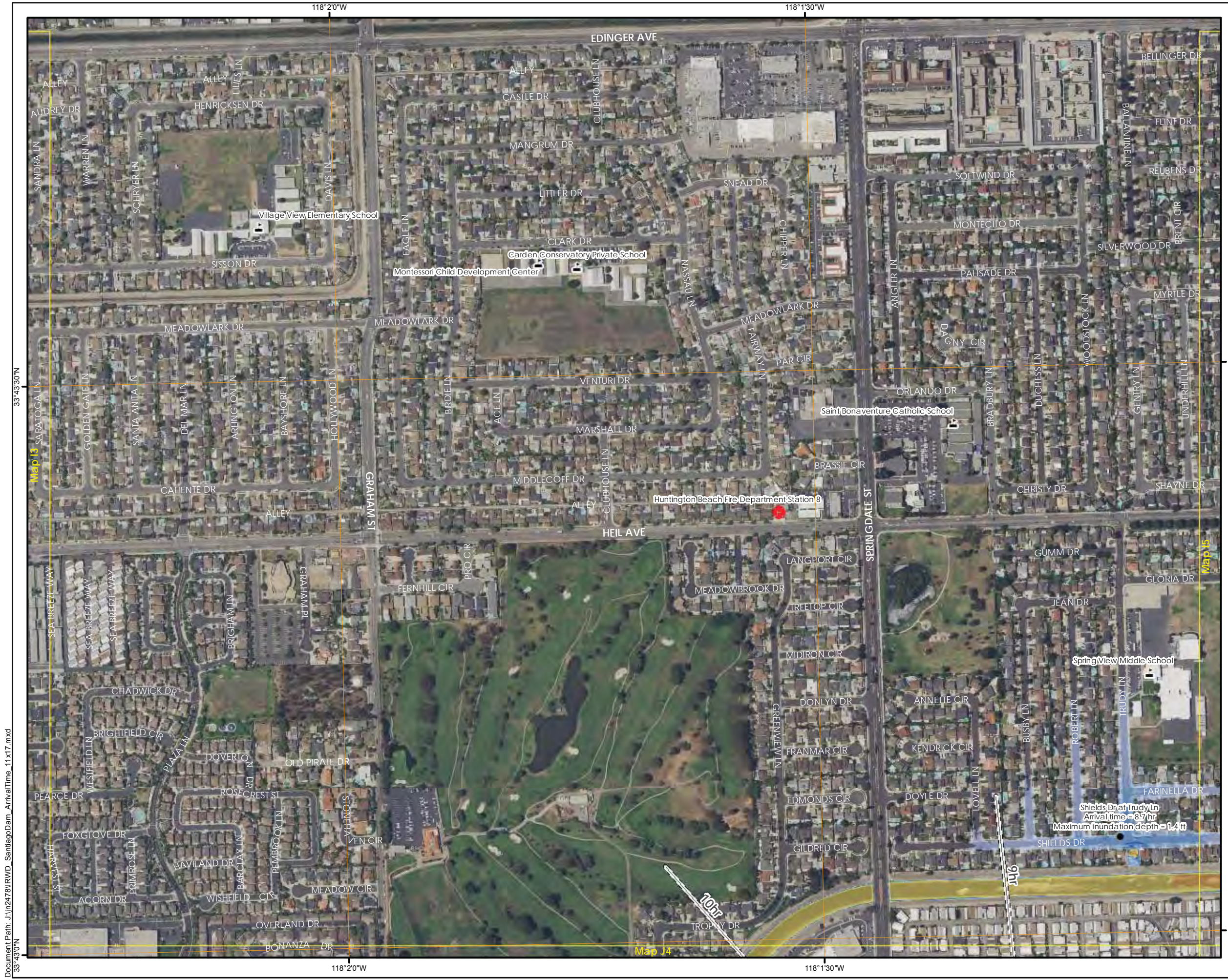
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

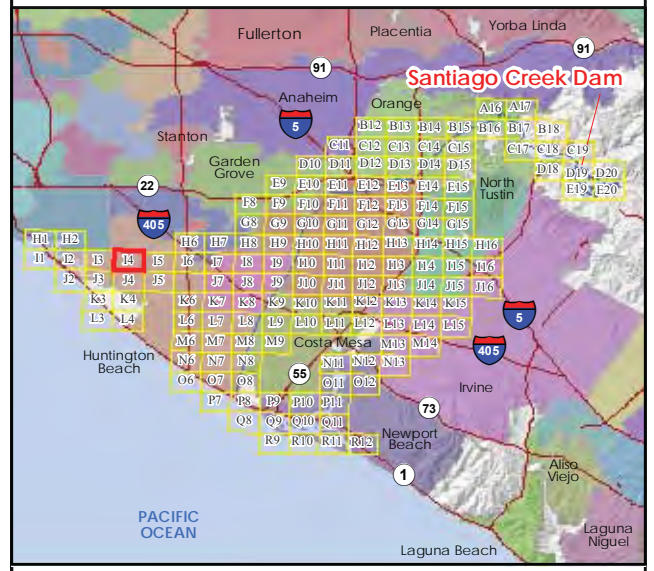
PANEL 67 of 148

**I3**

N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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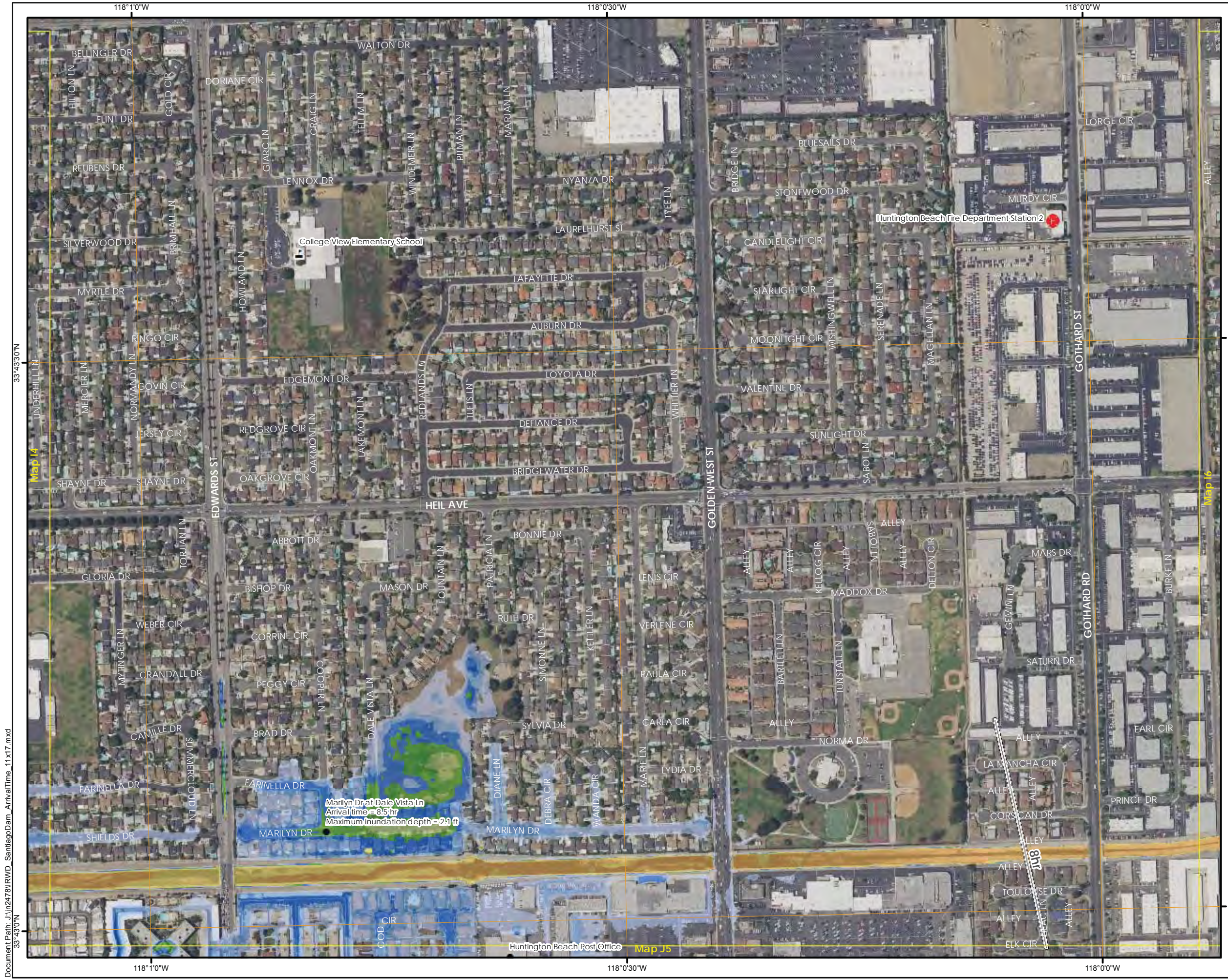
*Molly Palmer*  
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 68 of 148

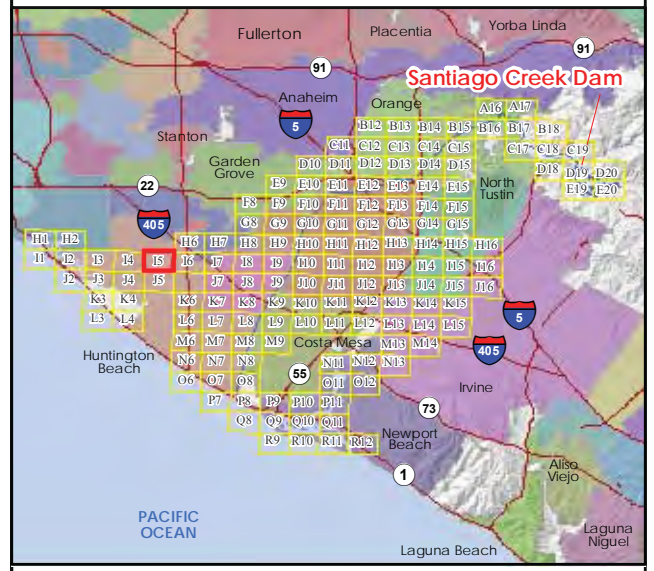
STETSON ENGINEERS INC.

0 250 500 750 Feet  
0 100 200 Meters

I4



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 69 of 148

STETSON ENGINEERS INC.

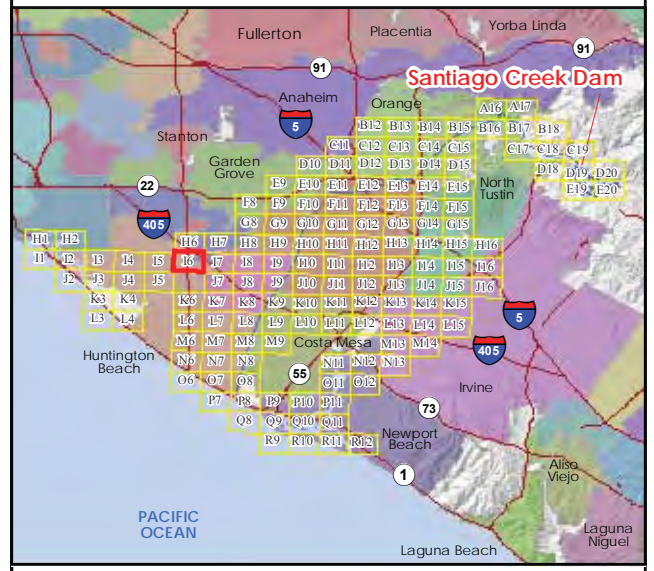
0 250 500 750 Feet  
0 100 200 Meters

N  
15





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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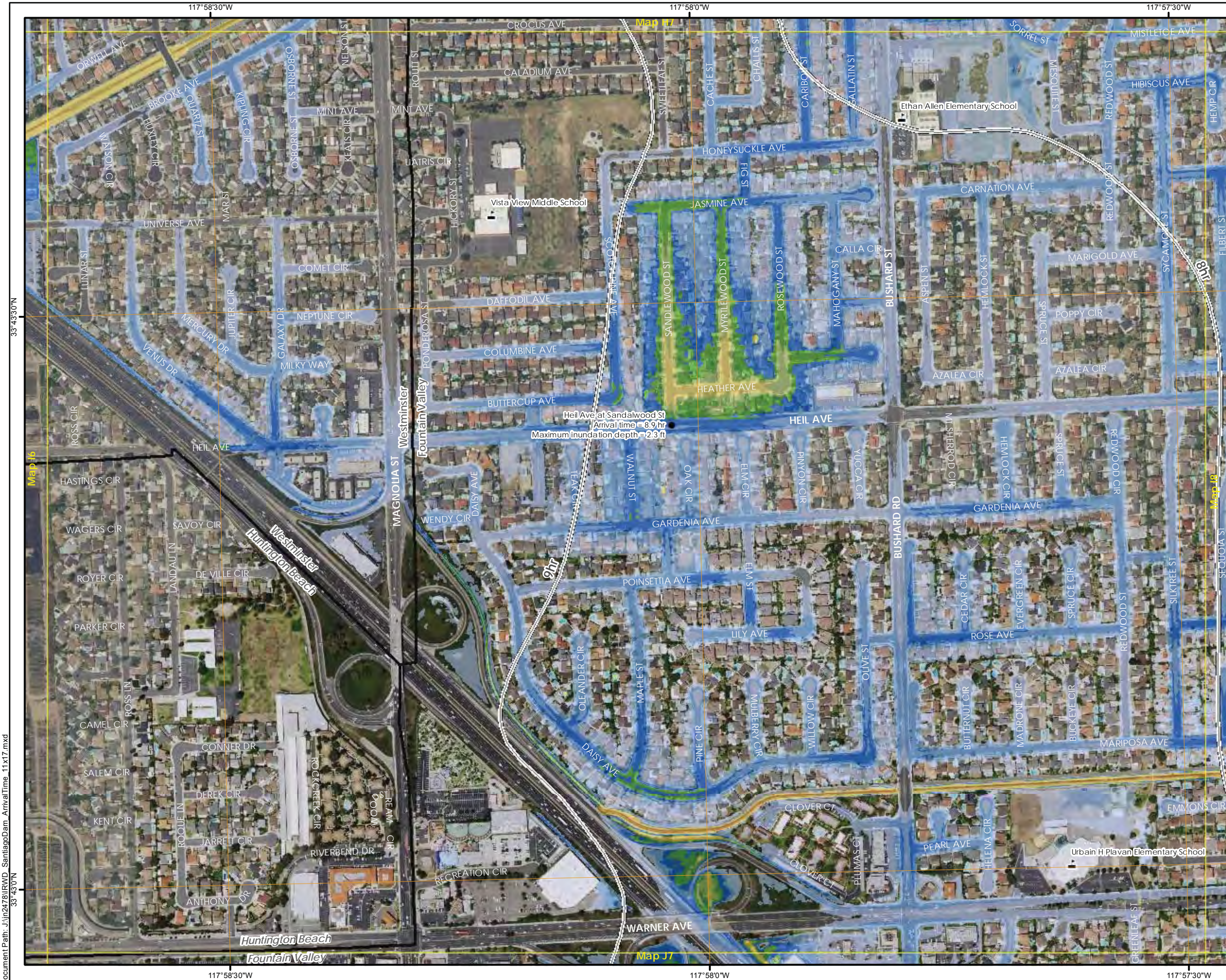
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

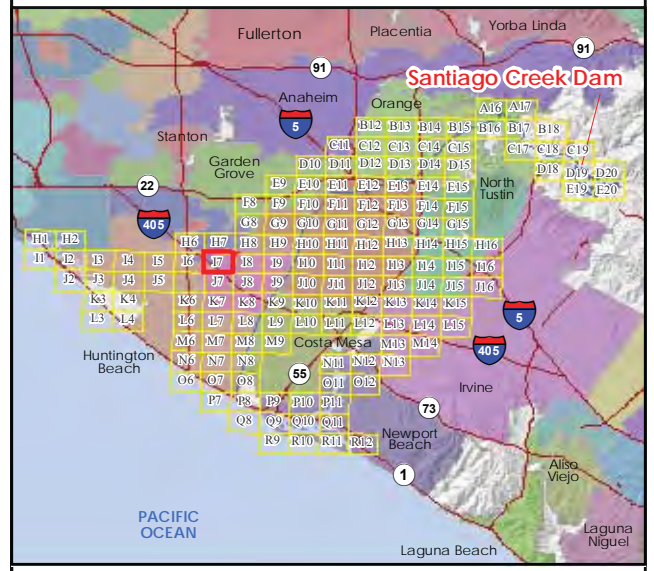
**PANEL 70 of 148**

**I6**

STETSON ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

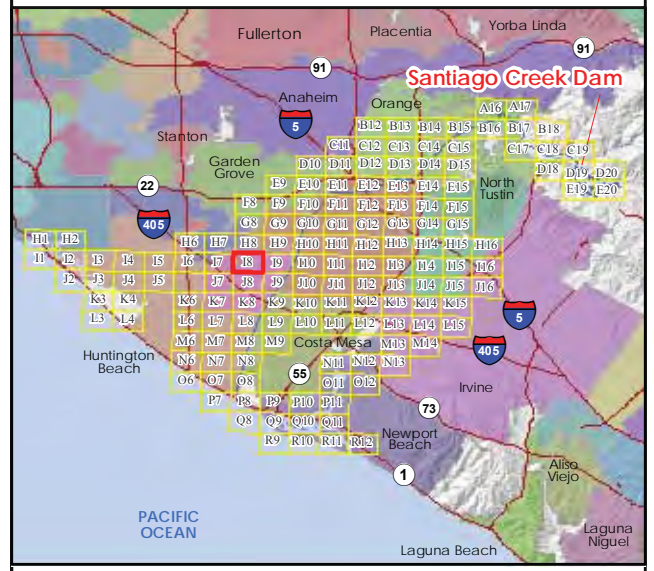
PANEL 71 of 148

N

**I7**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 72 of 148**

**STETSON**  
ENGINEERS INC.

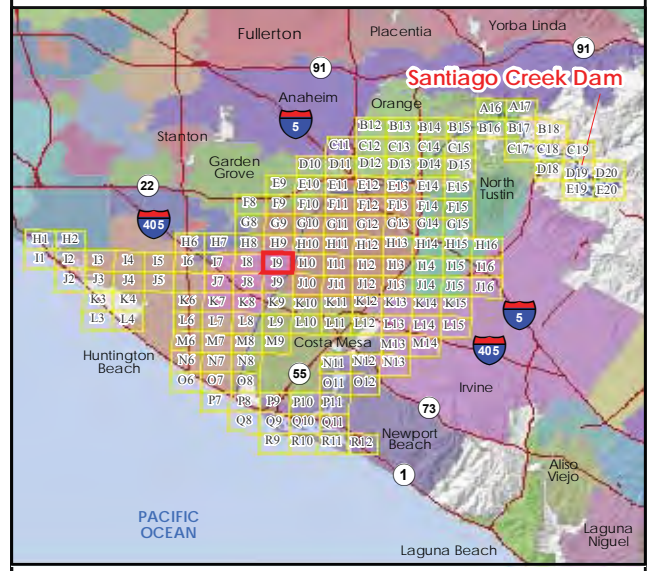
**I8**

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33°43'30"N



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- S School
- F Fire Station
- H Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

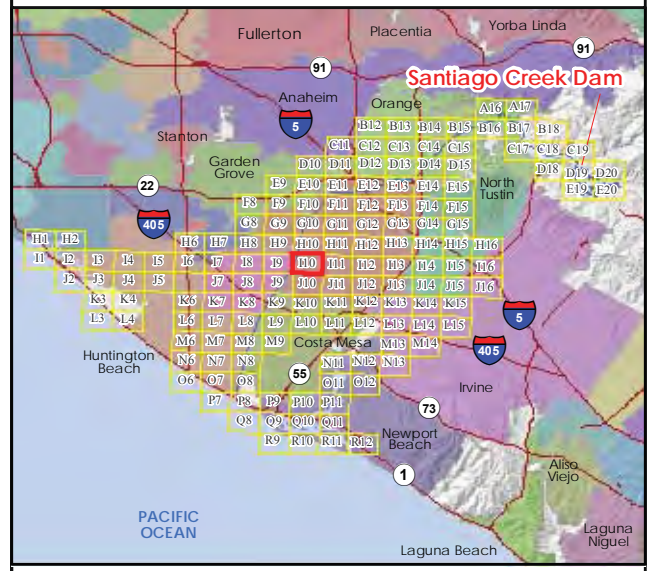
STATE OF CALIFORNIA

**PANEL 73 of 148**

**I9**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

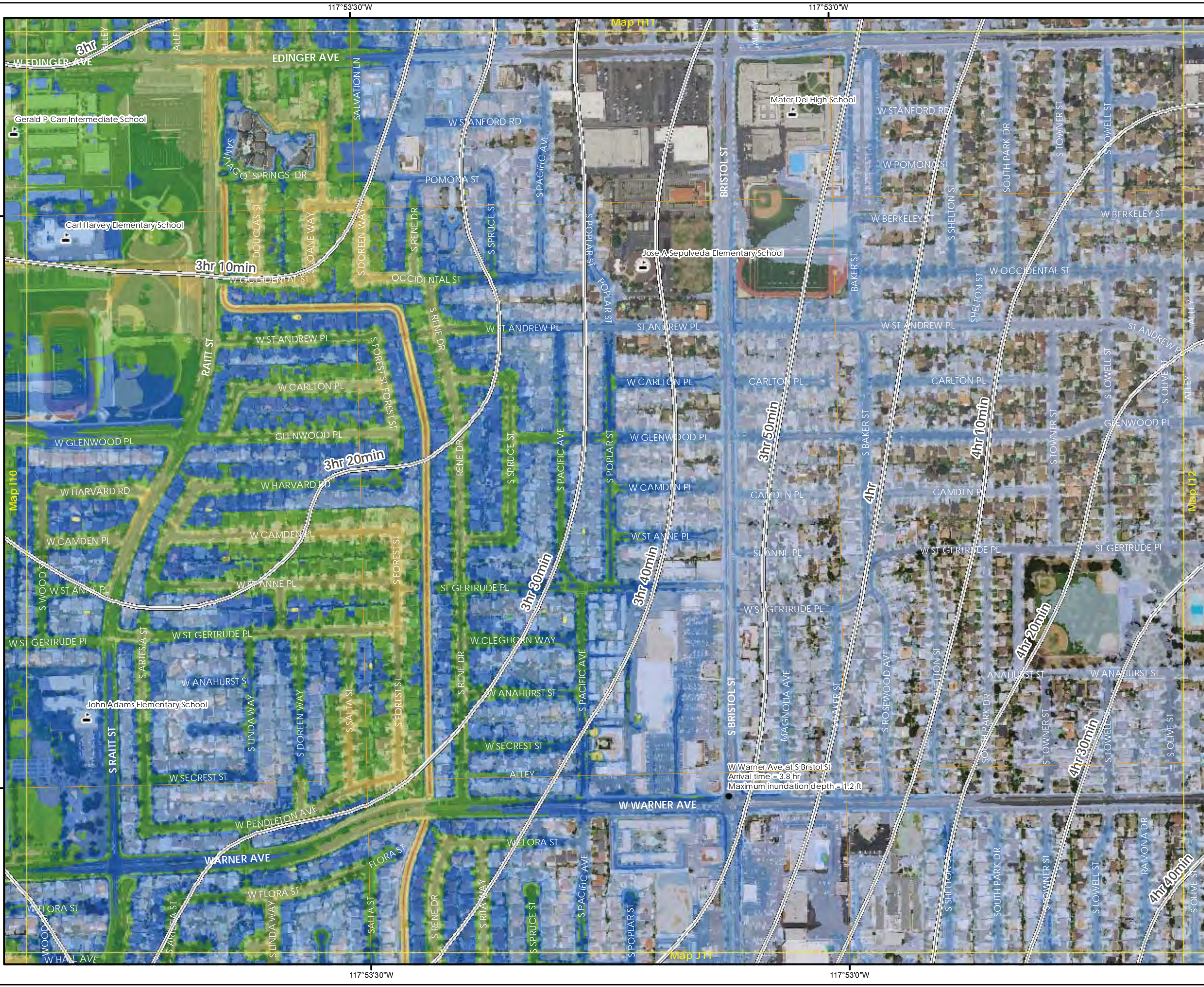
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 74 of 148

**I10**

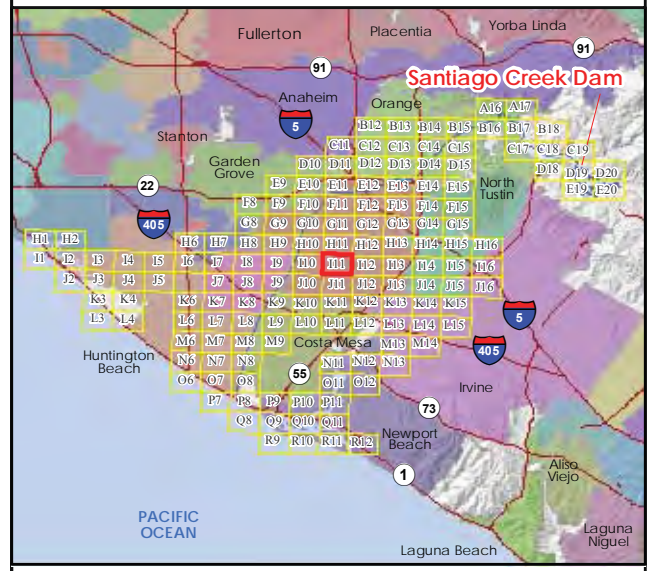
**STETSON**  
ENGINEERS INC.

Document Path: J:\m2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd 33°43'30"N



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

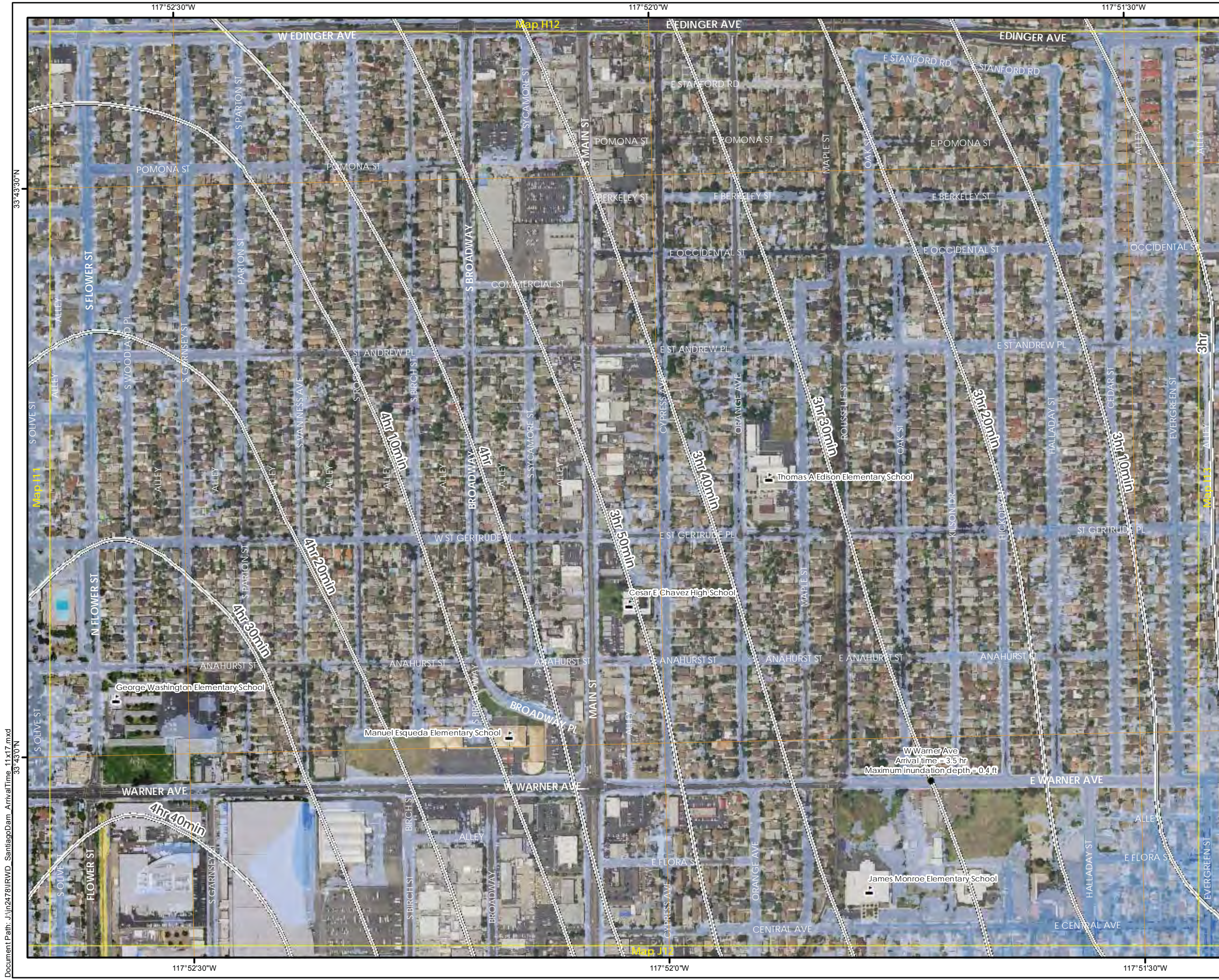
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*Molly Palmer*

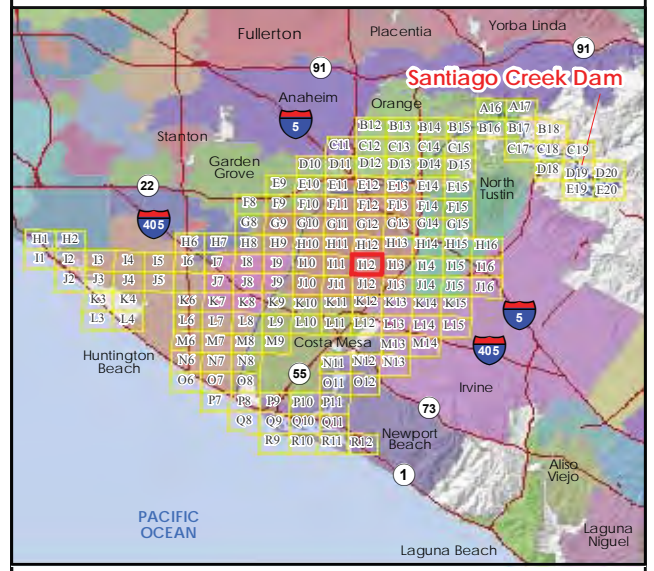
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 75 of 148**

**I11**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

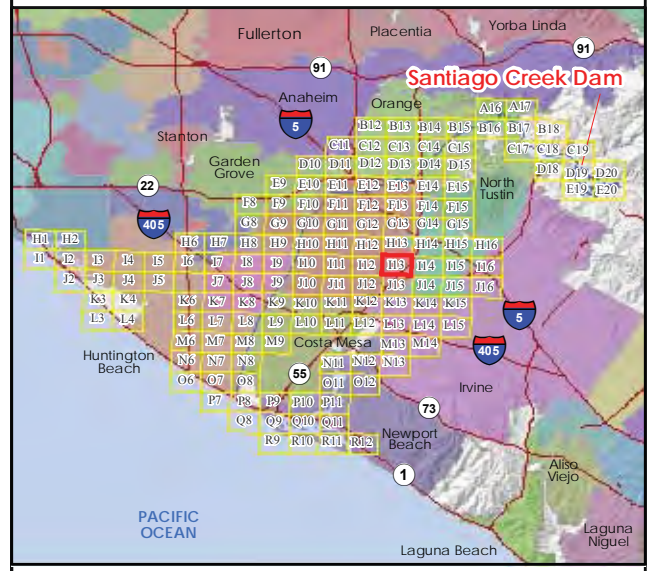
PANEL 76 of 148

**I12**

STETSON ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- F Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

PANEL 77 of 148

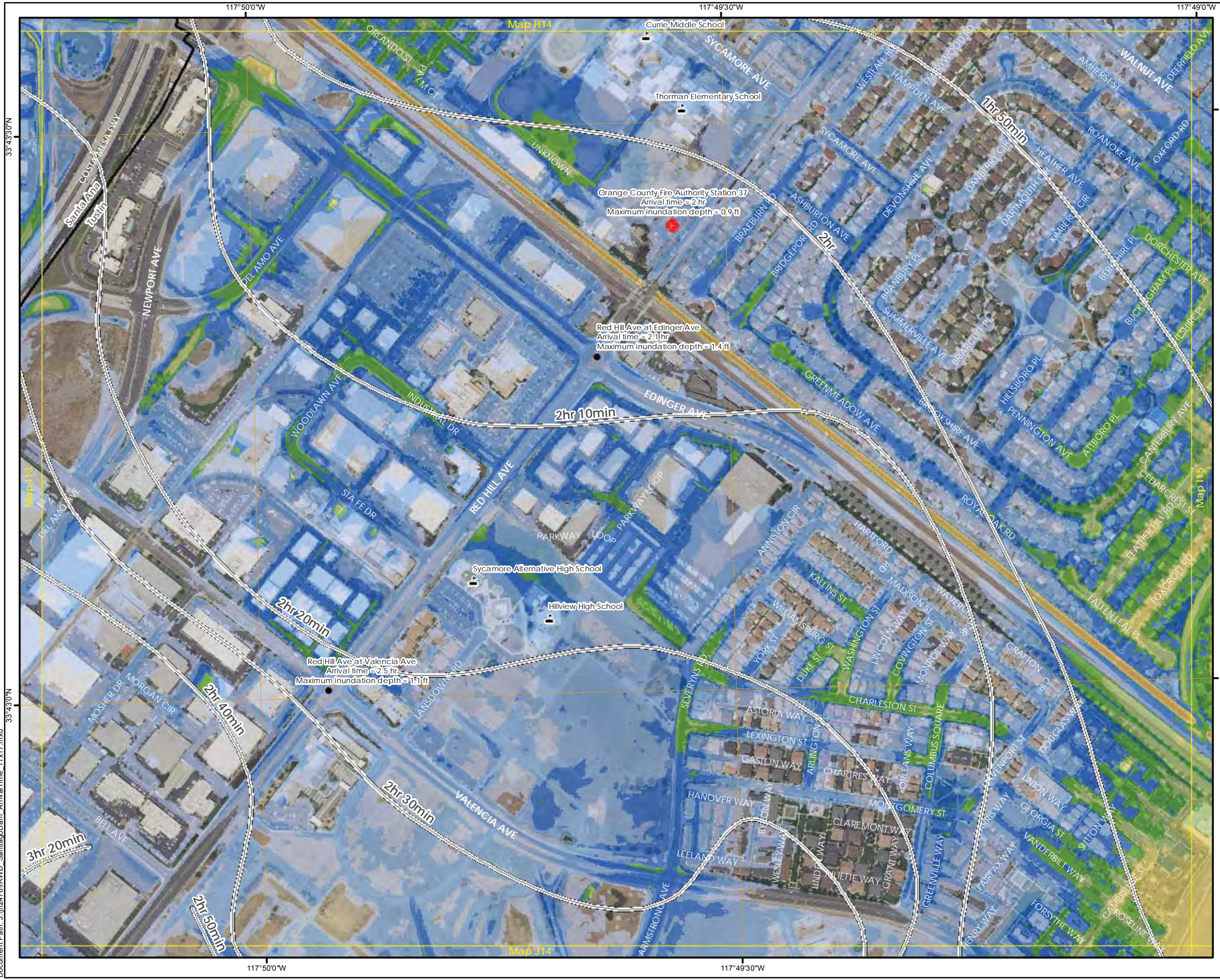
**I13**

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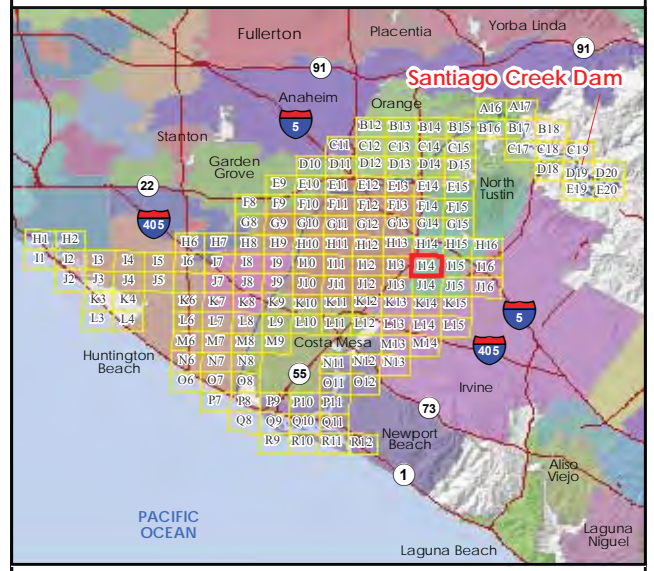
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N





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

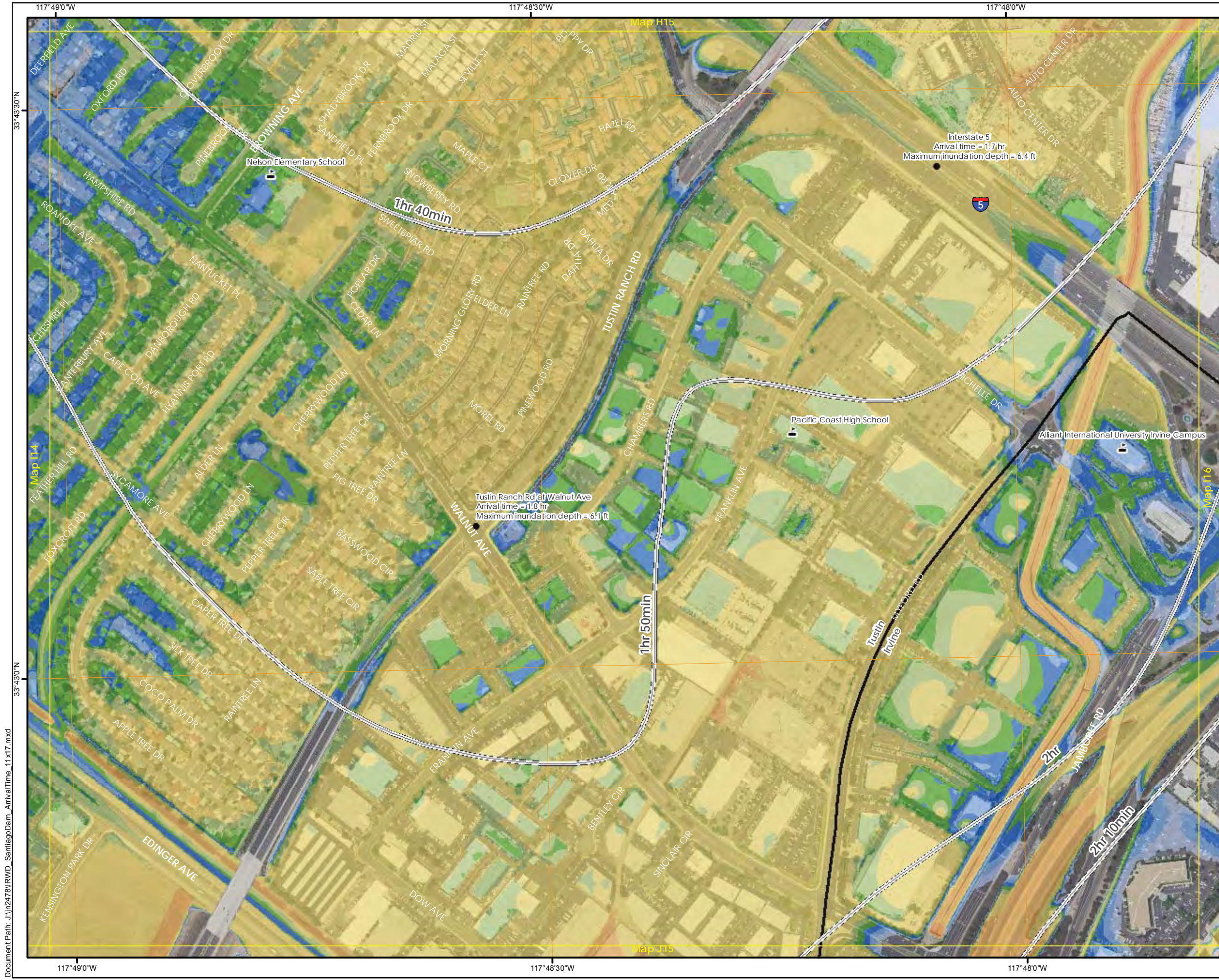
STATE OF CALIFORNIA

**PANEL 78 of 148**

**I14**

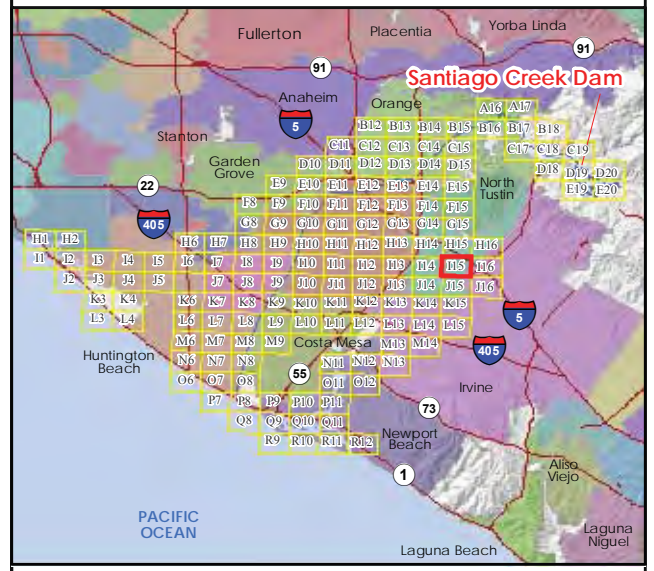
0 250 500 750 Feet

0 100 200 Meters



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

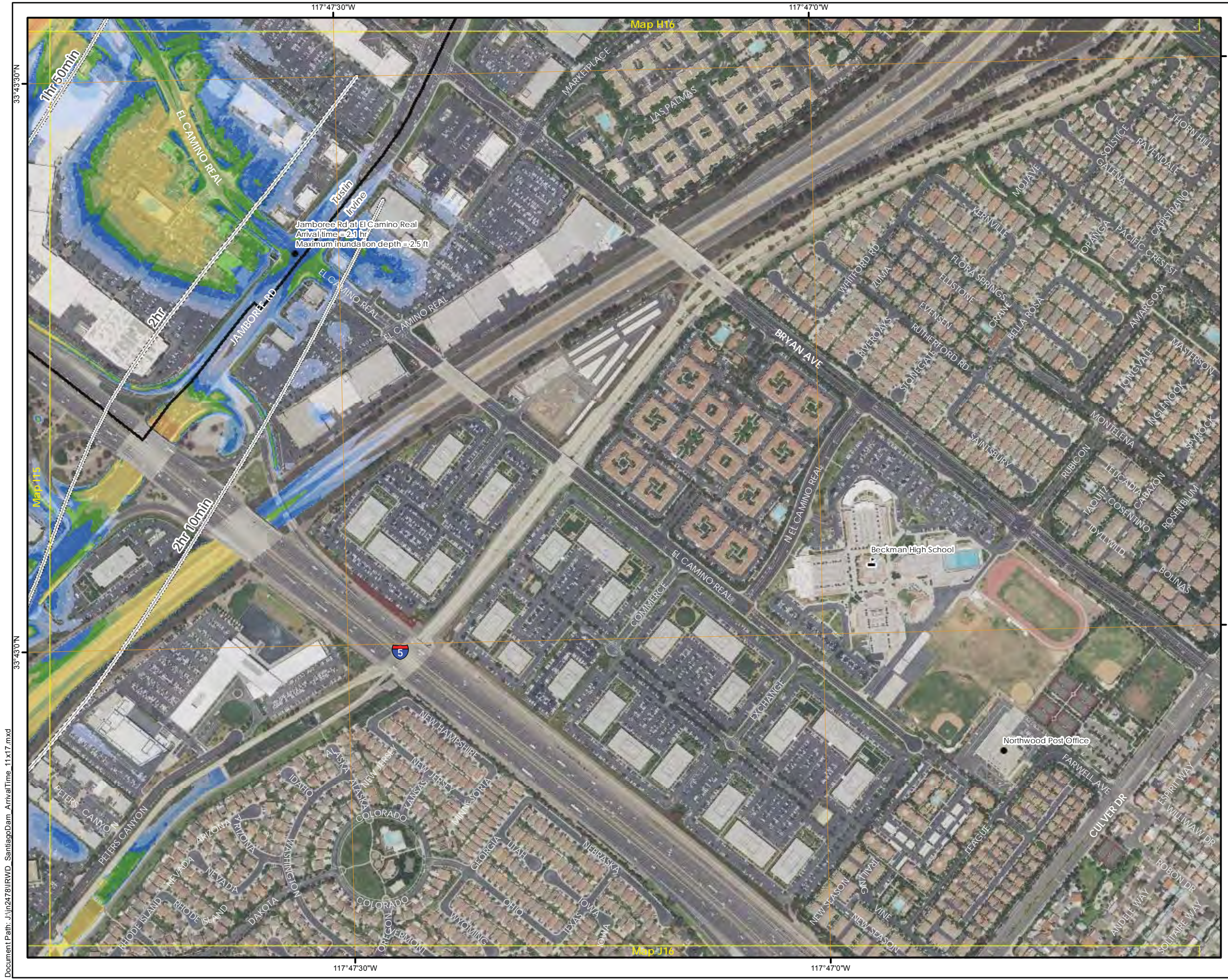
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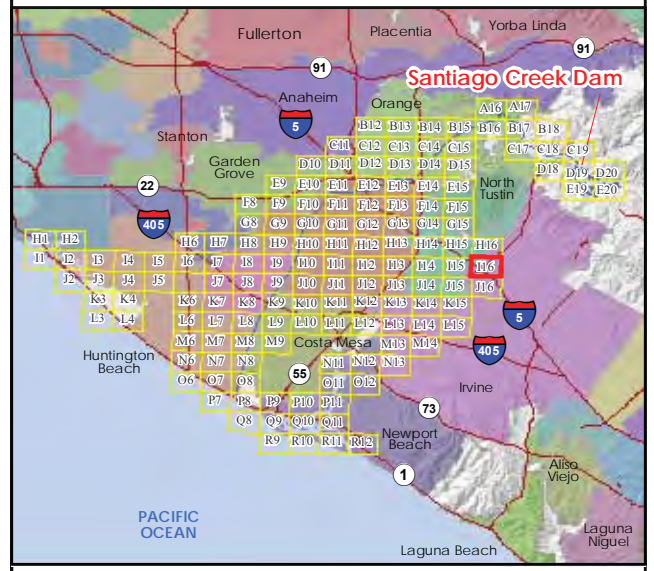
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 79 of 148**

**I15**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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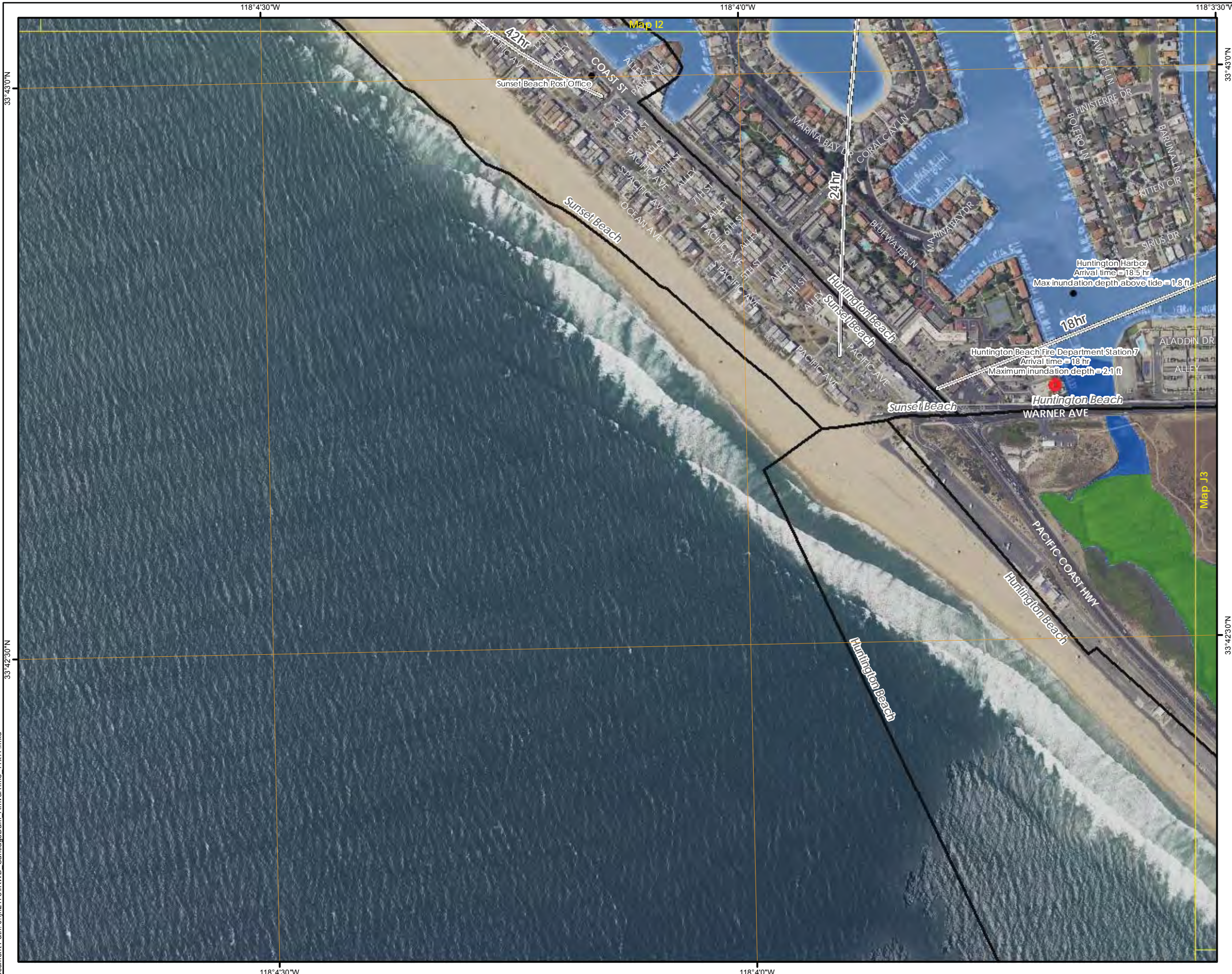
*Molly Palmer*

REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

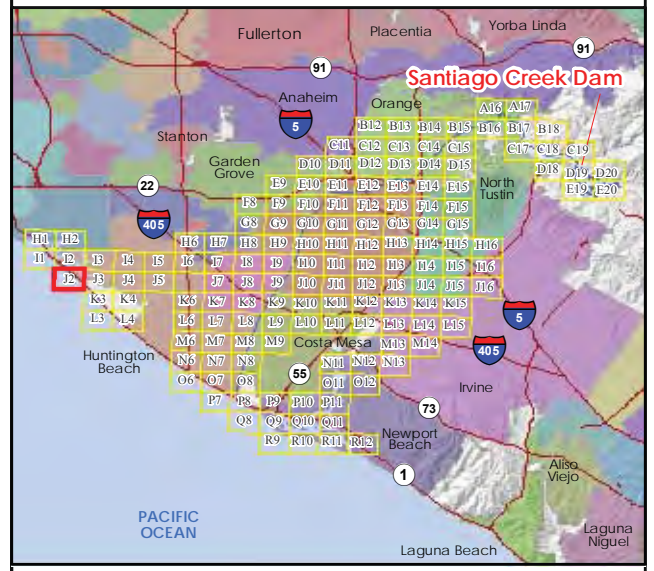
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 80 of 148**

**I16**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

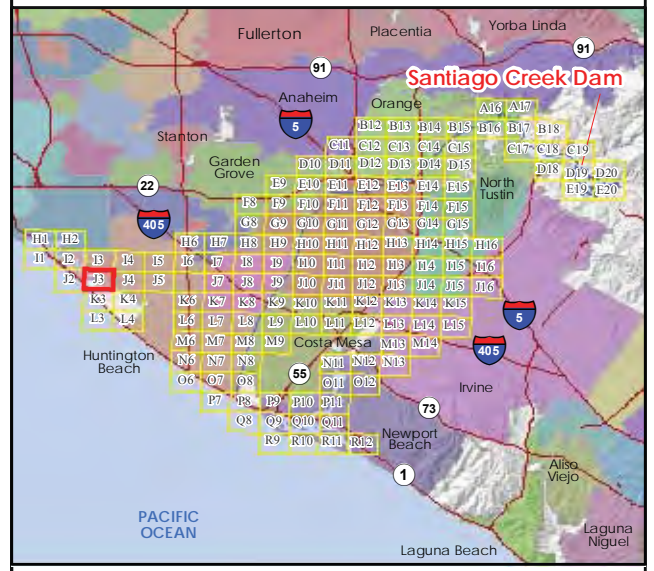
PANEL 81 of 148

**J2**

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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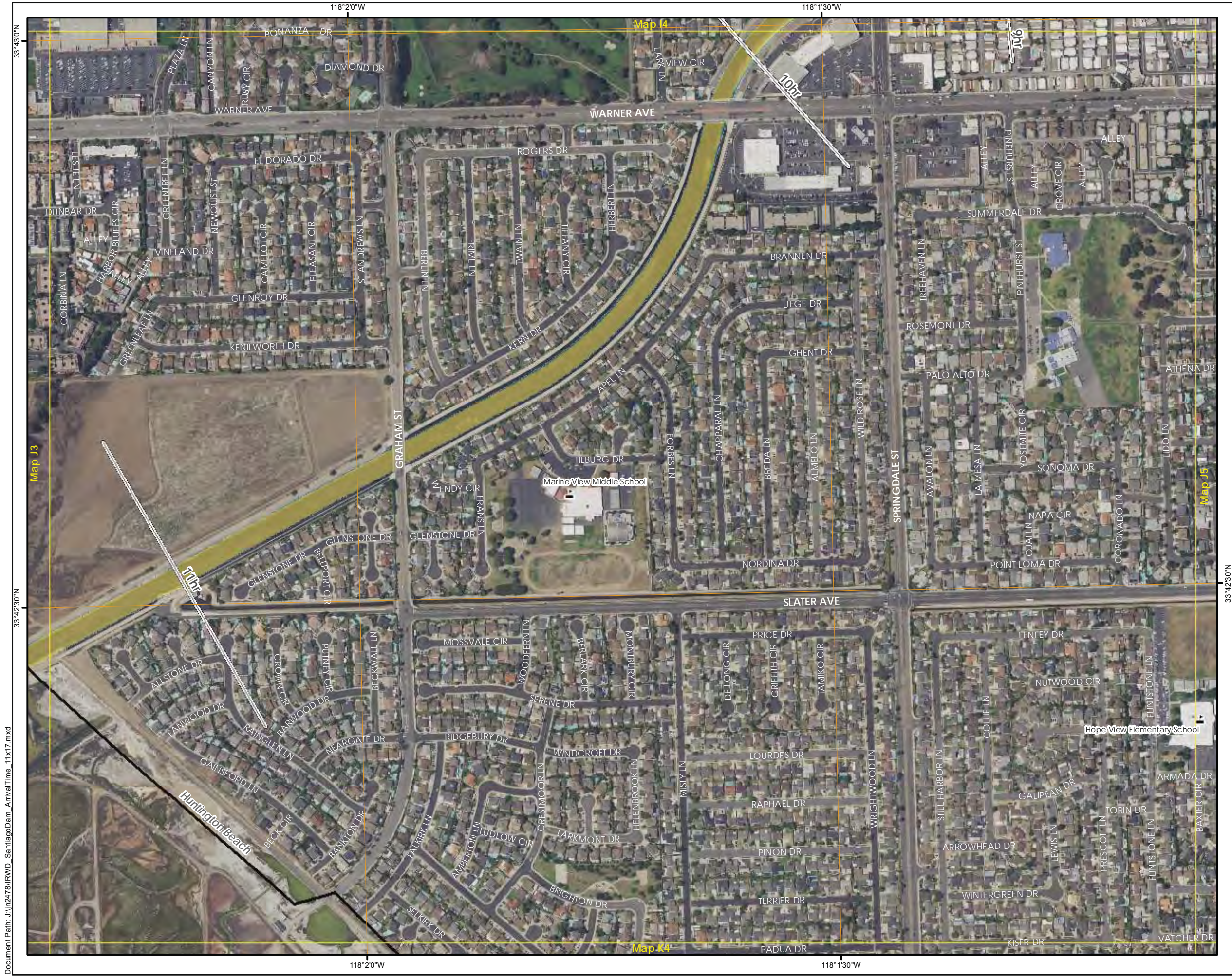
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*Molly Palmer*

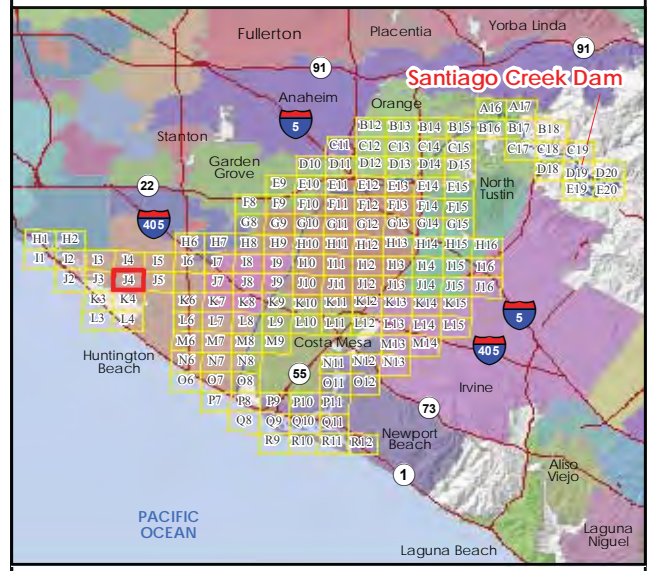
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 82 of 148

**J3**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

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Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

**PANEL 83 of 148**

N

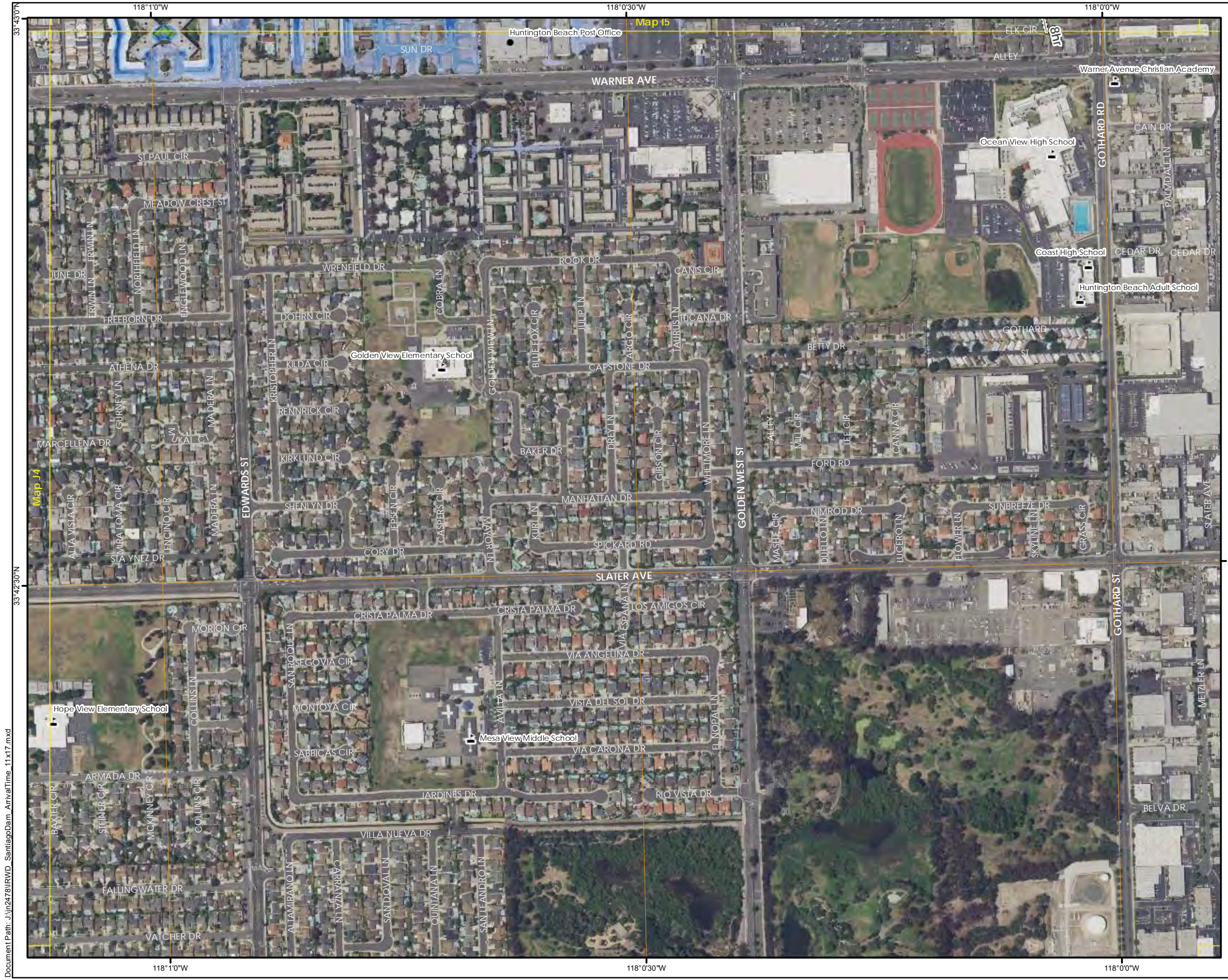
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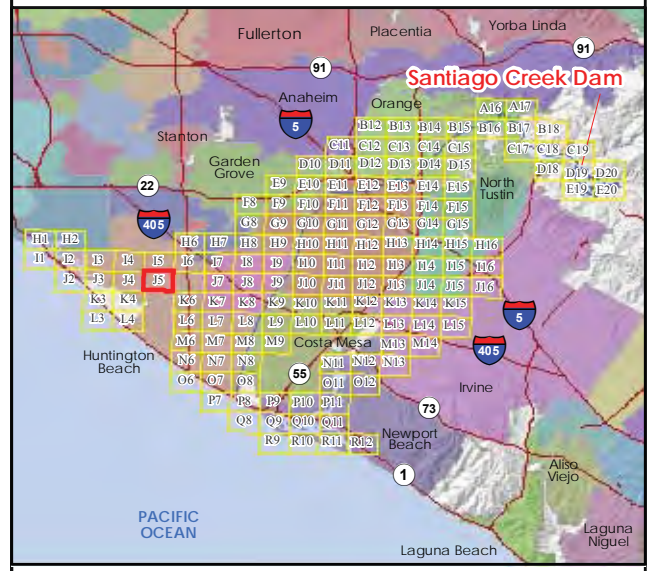
Feet

0 100 200

Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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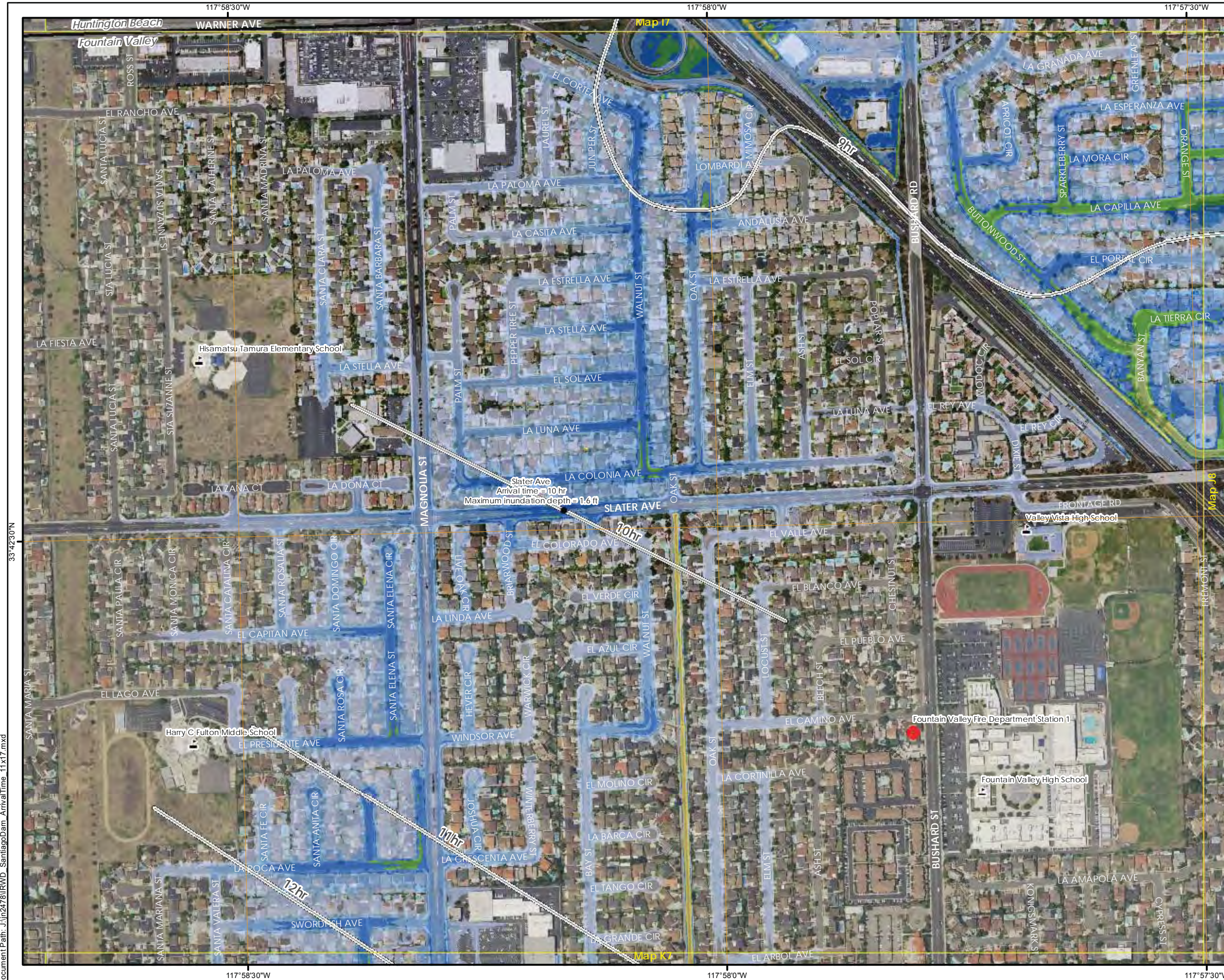
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**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

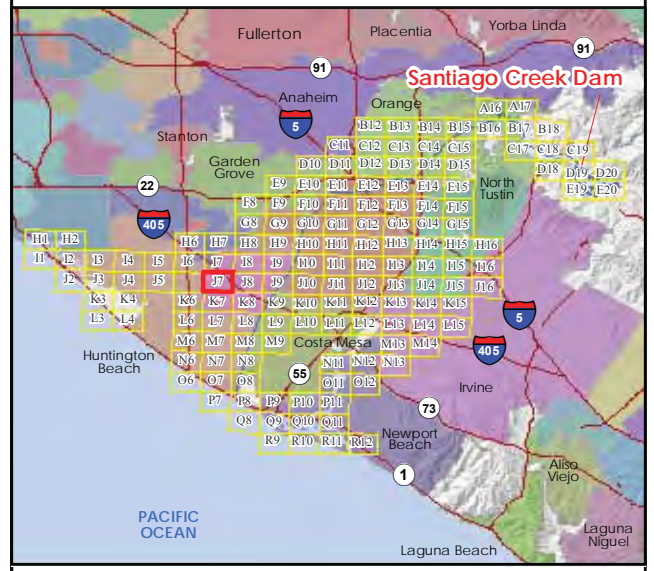
**PANEL 84 of 148**

N

**J5**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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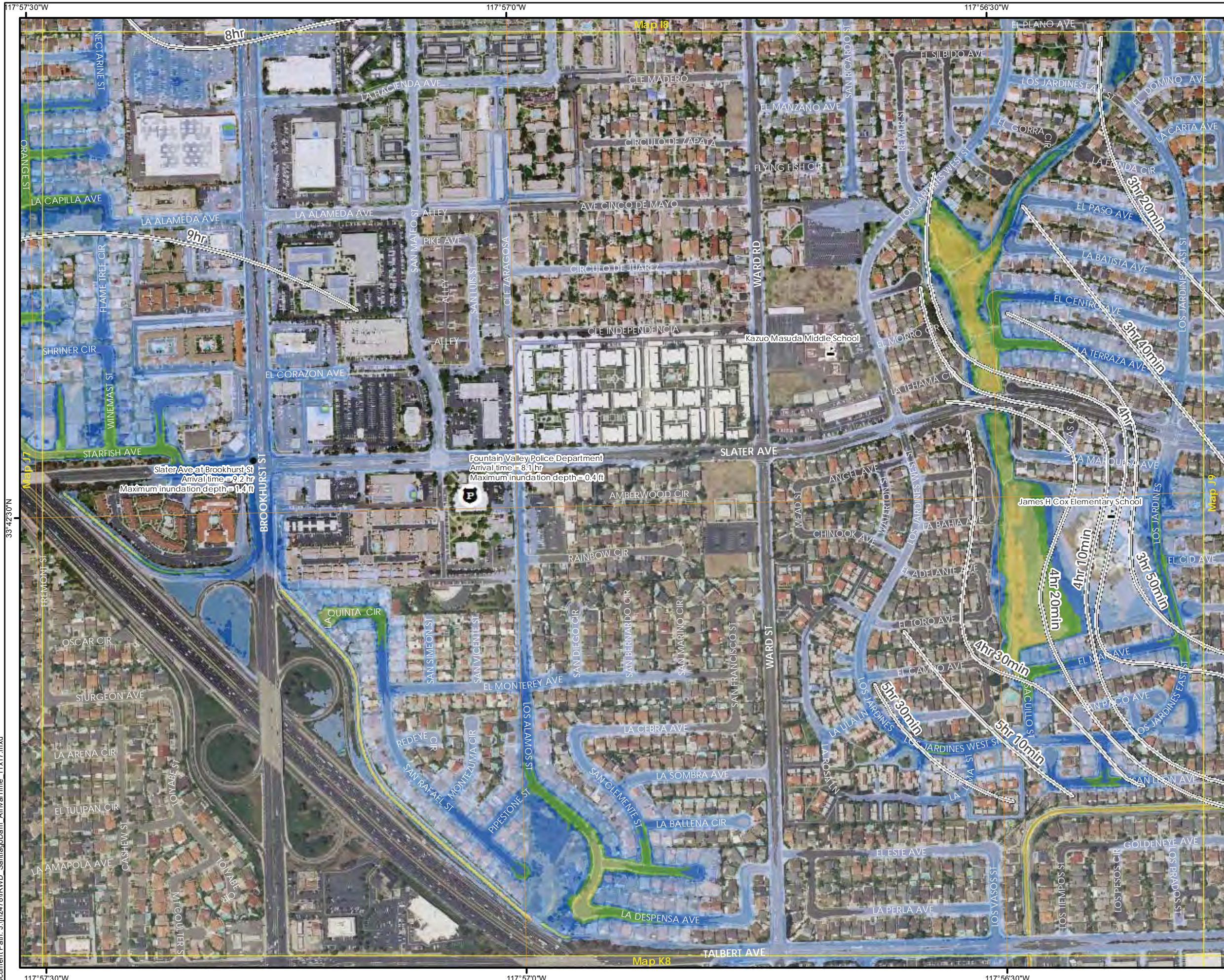
**PANEL 85 of 148**

**J7**

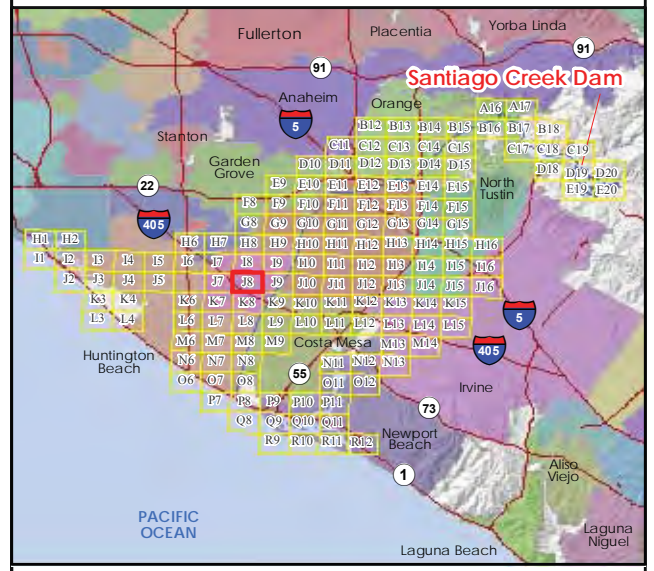
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Feet

0 100 200  
Meters





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Police Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 86 of 148

**J8**

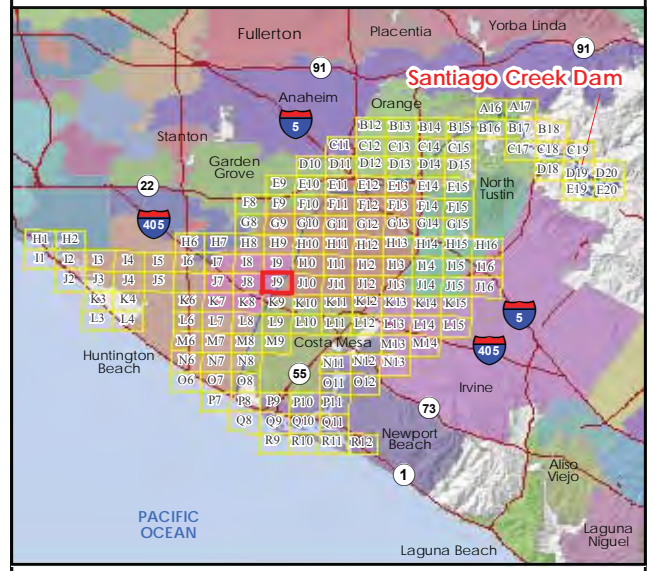
**STETSON ENGINEERS INC.**



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# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- H Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

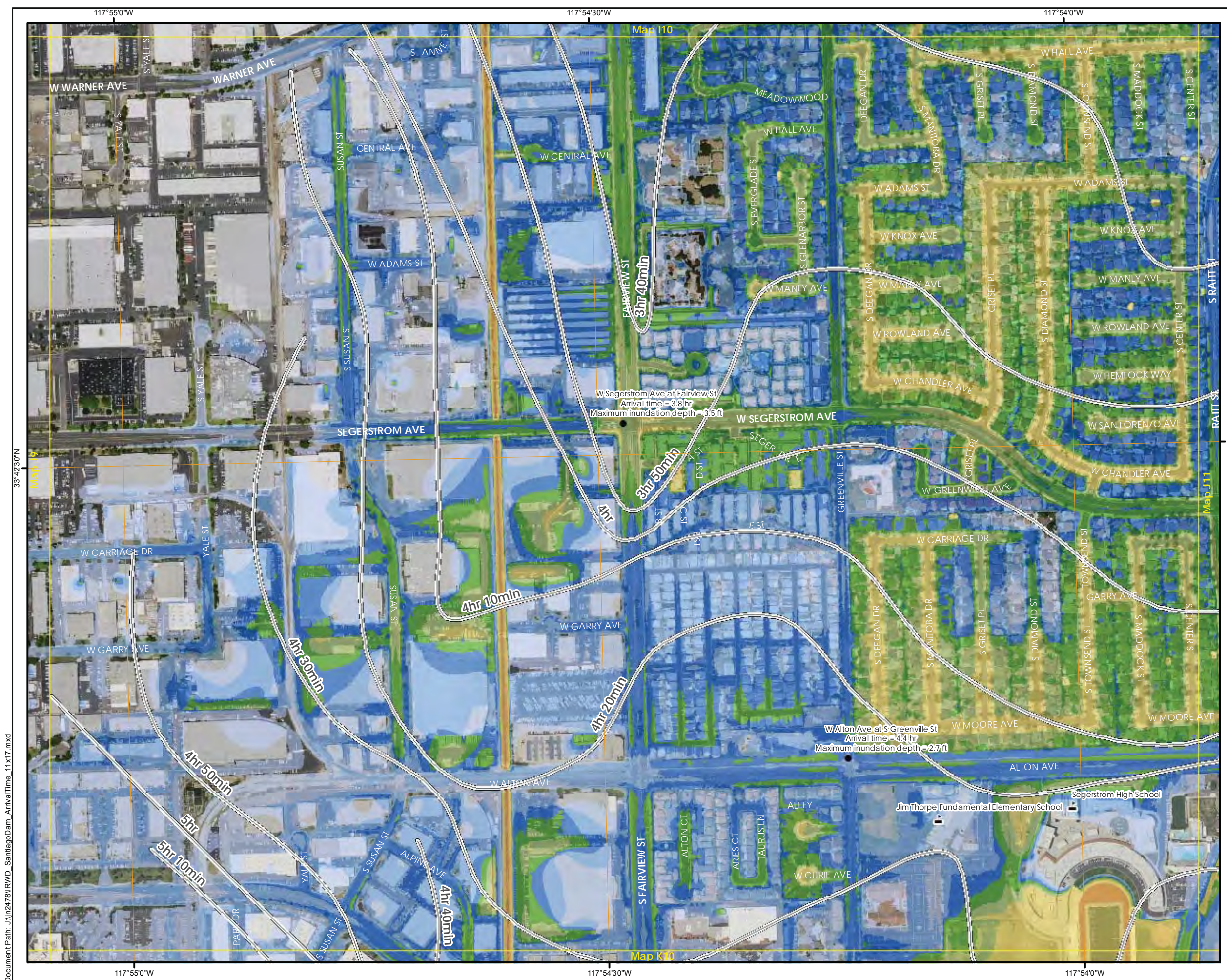
PANEL 87 of 148

N

**J9**

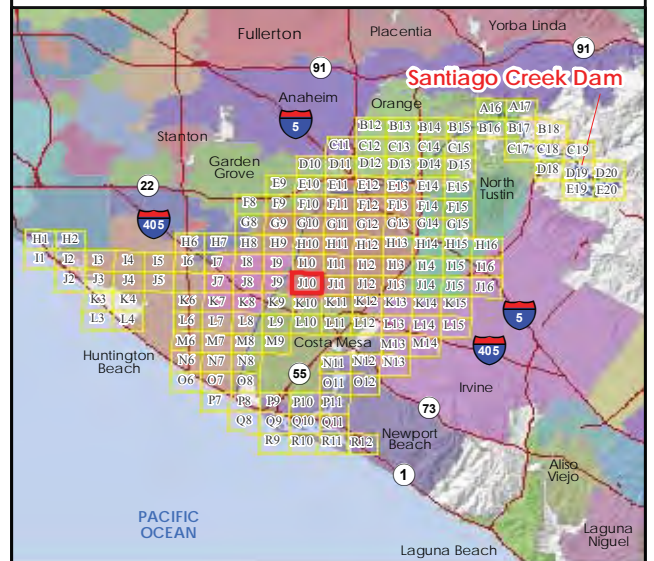
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Feet

0 100 200  
Meters



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 88 of 148

STETSON ENGINEERS INC.

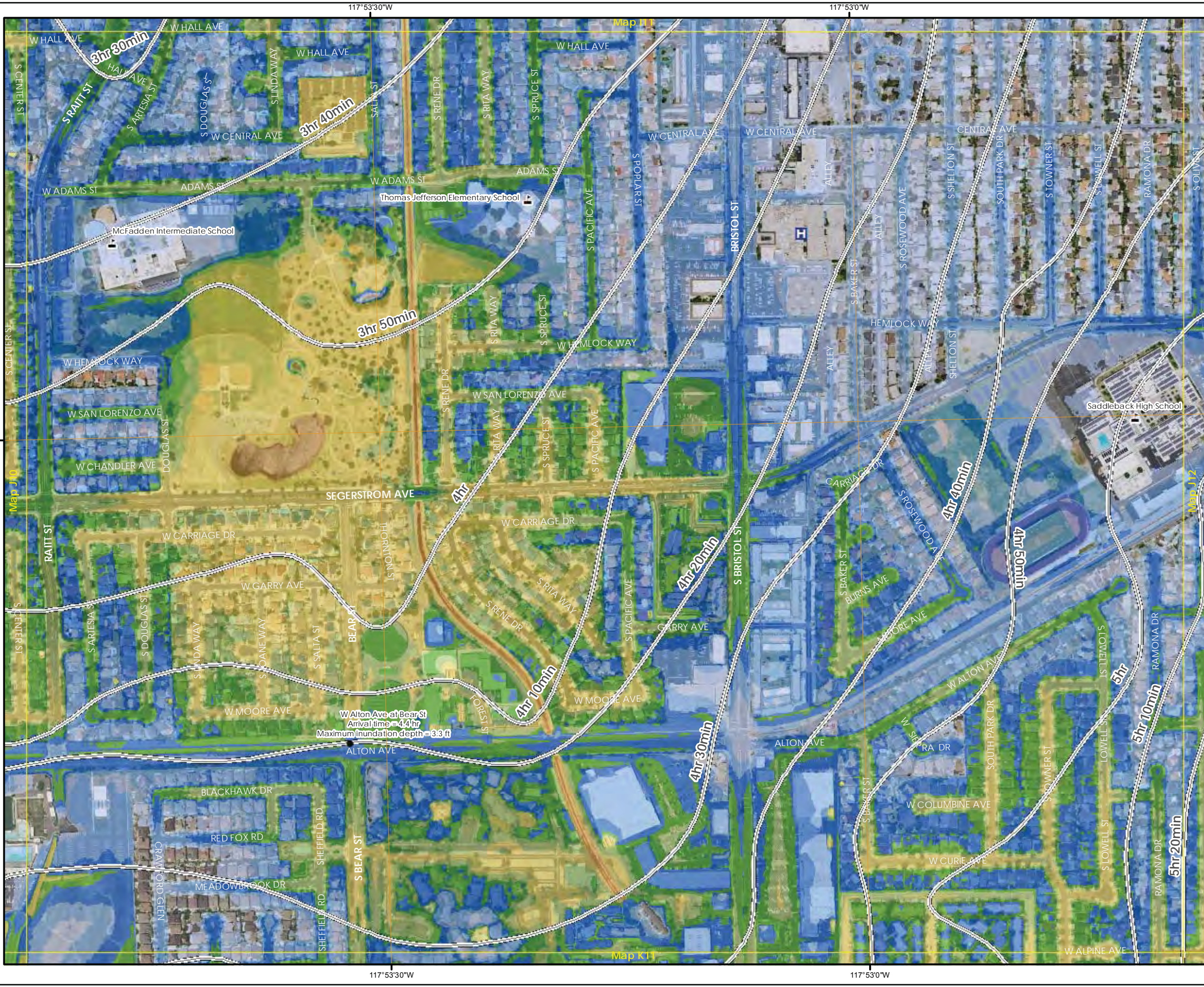
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0 250 500 750 Feet  
0 100 200 Meters

J10

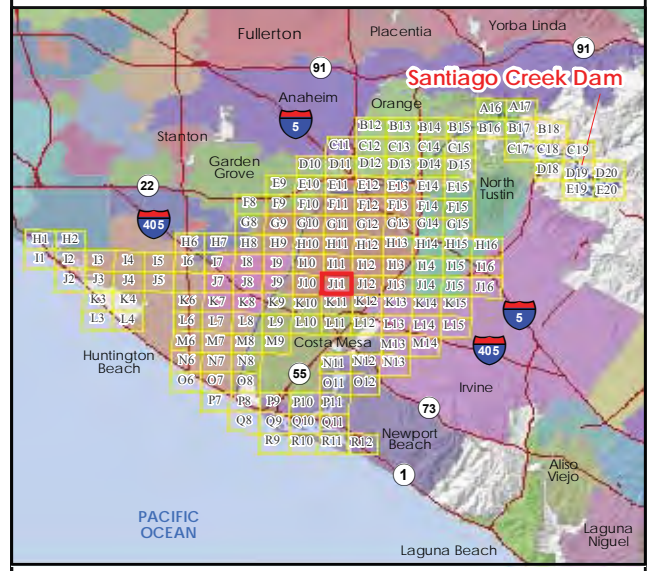
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# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 89 of 148**

**N**

**J11**

0 250 500 750 Feet

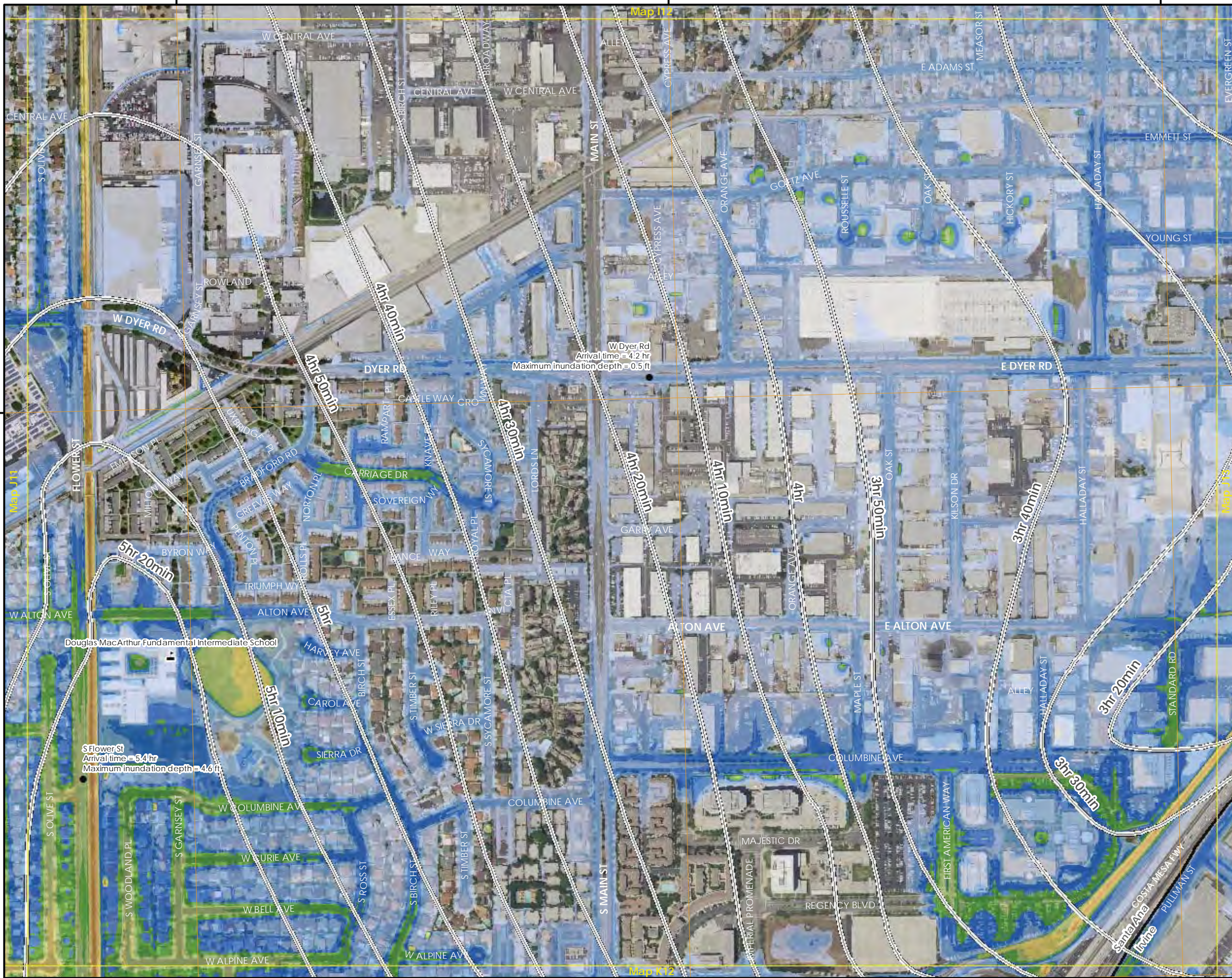
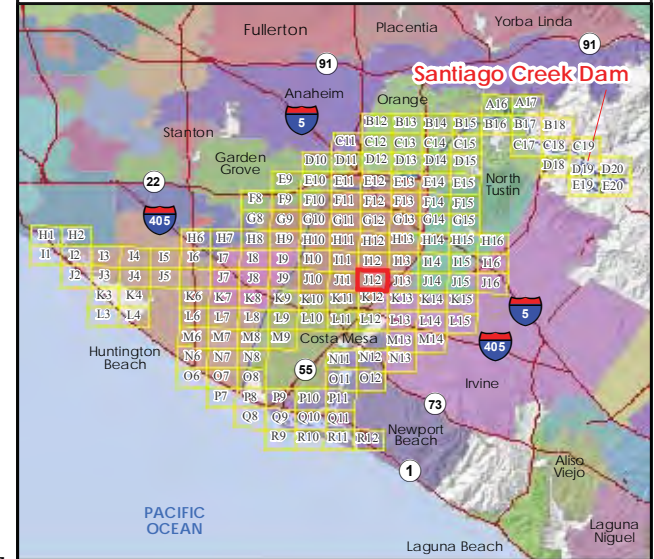
0 100 200 Meters

117°52'30"W

117°52'0"W

117°51'30"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



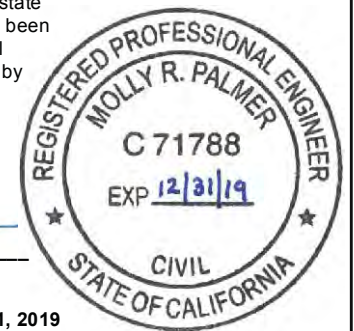
**Legend**

- |               |          |
|---------------|----------|
| Map Panel #   | 0-1 ft   |
| Dam Crest     | 1-2 ft   |
| River         | 2-3 ft   |
| Arrival Time  | 3-4 ft   |
| City Boundary | 4-5 ft   |
| River Mile    | 5-10 ft  |
| School        | 10-20 ft |
|               | 20-30 ft |
|               | 30-40 ft |
|               | >40 ft   |

1/26/2018

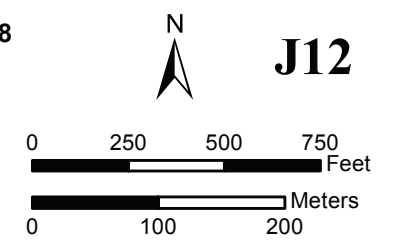
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Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 90 of 148



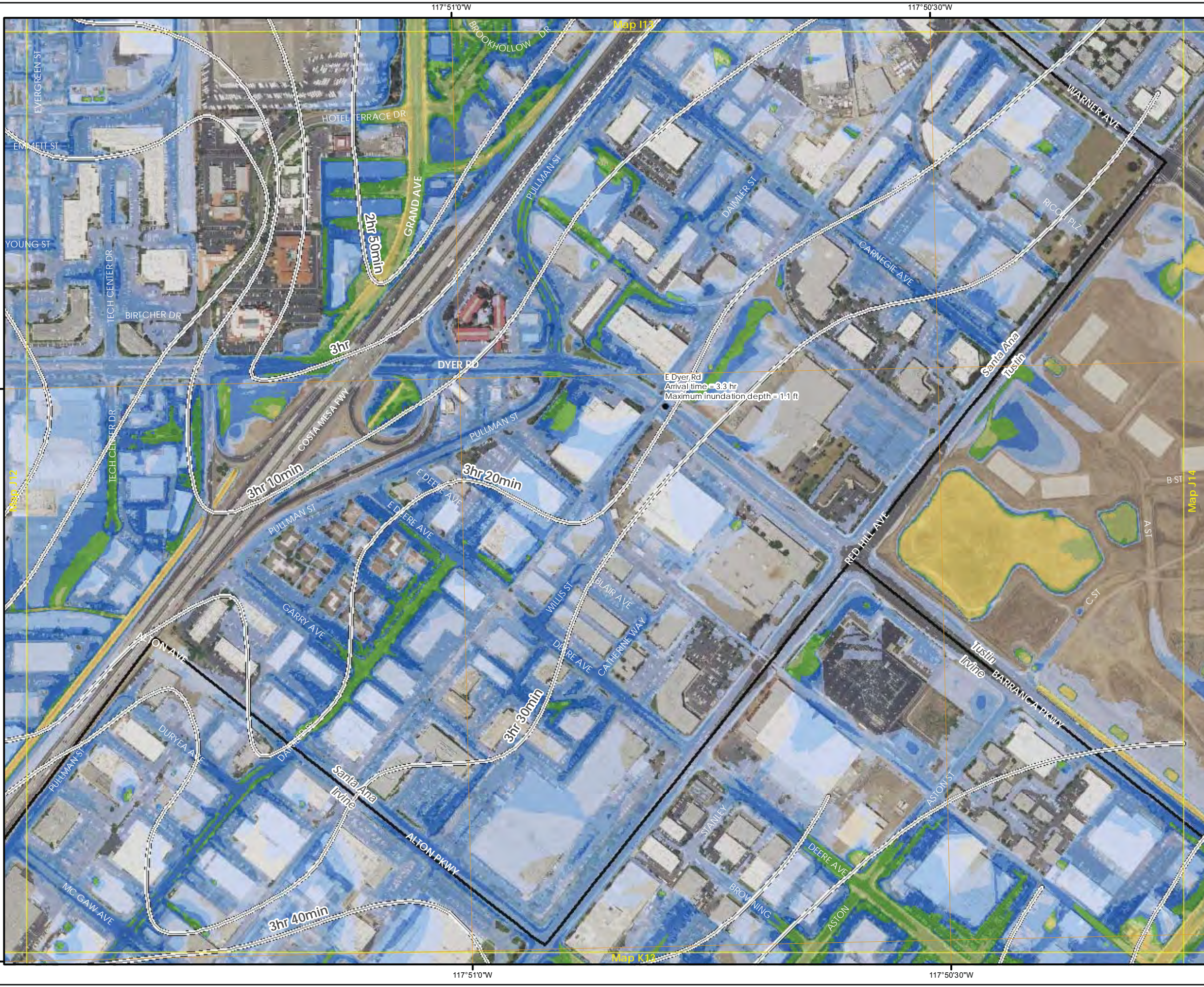
J12

117°52'30"W

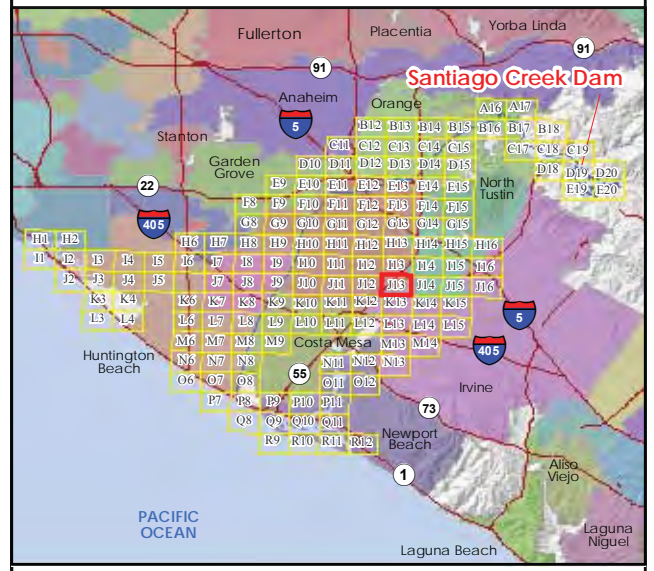
117°52'0"W

117°51'30"W

33°42'0"N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

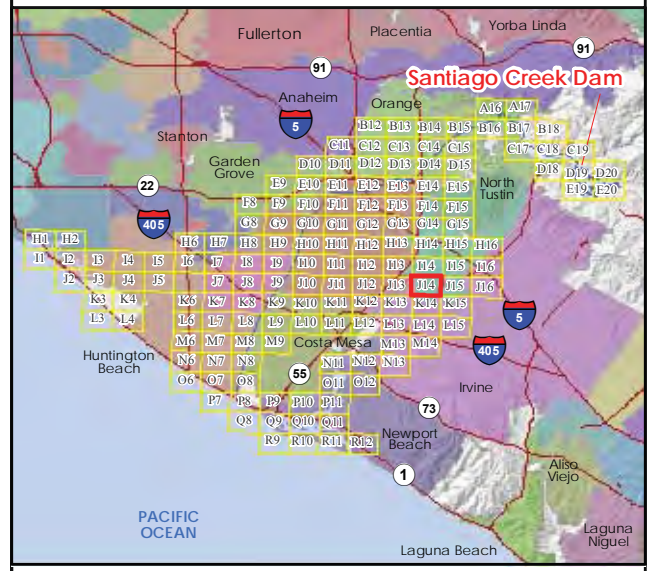
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 91 of 148

**J13**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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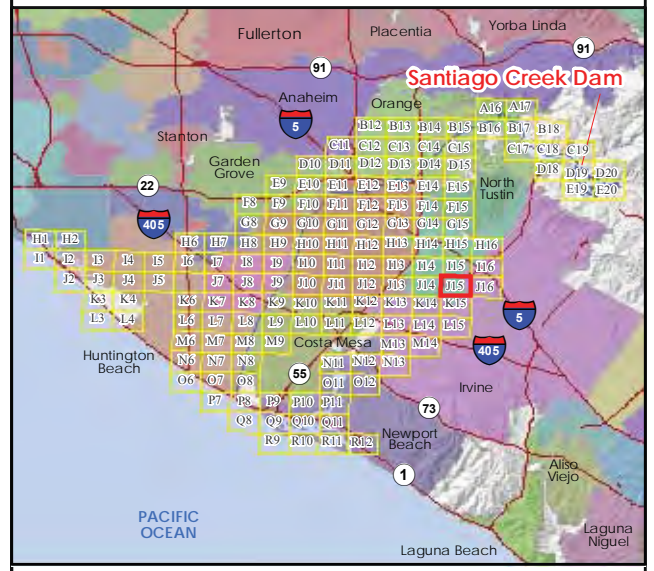
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 92 of 148** **J14**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 93 of 148

**J15**

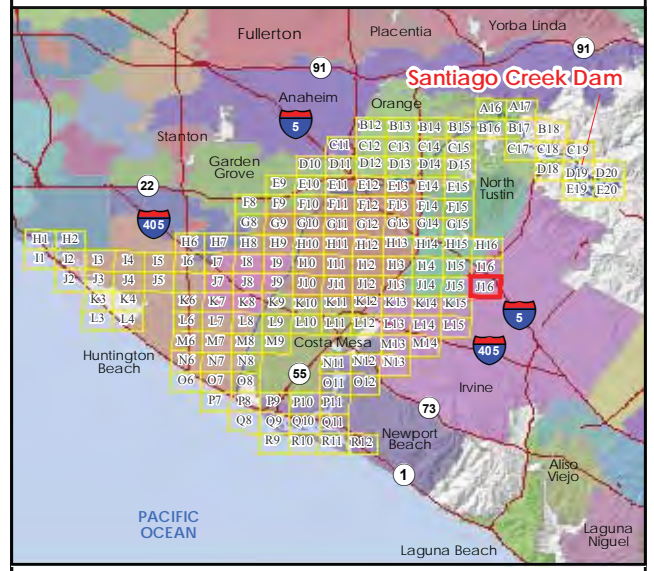
N

STETSON  
ENGINEERS INC.





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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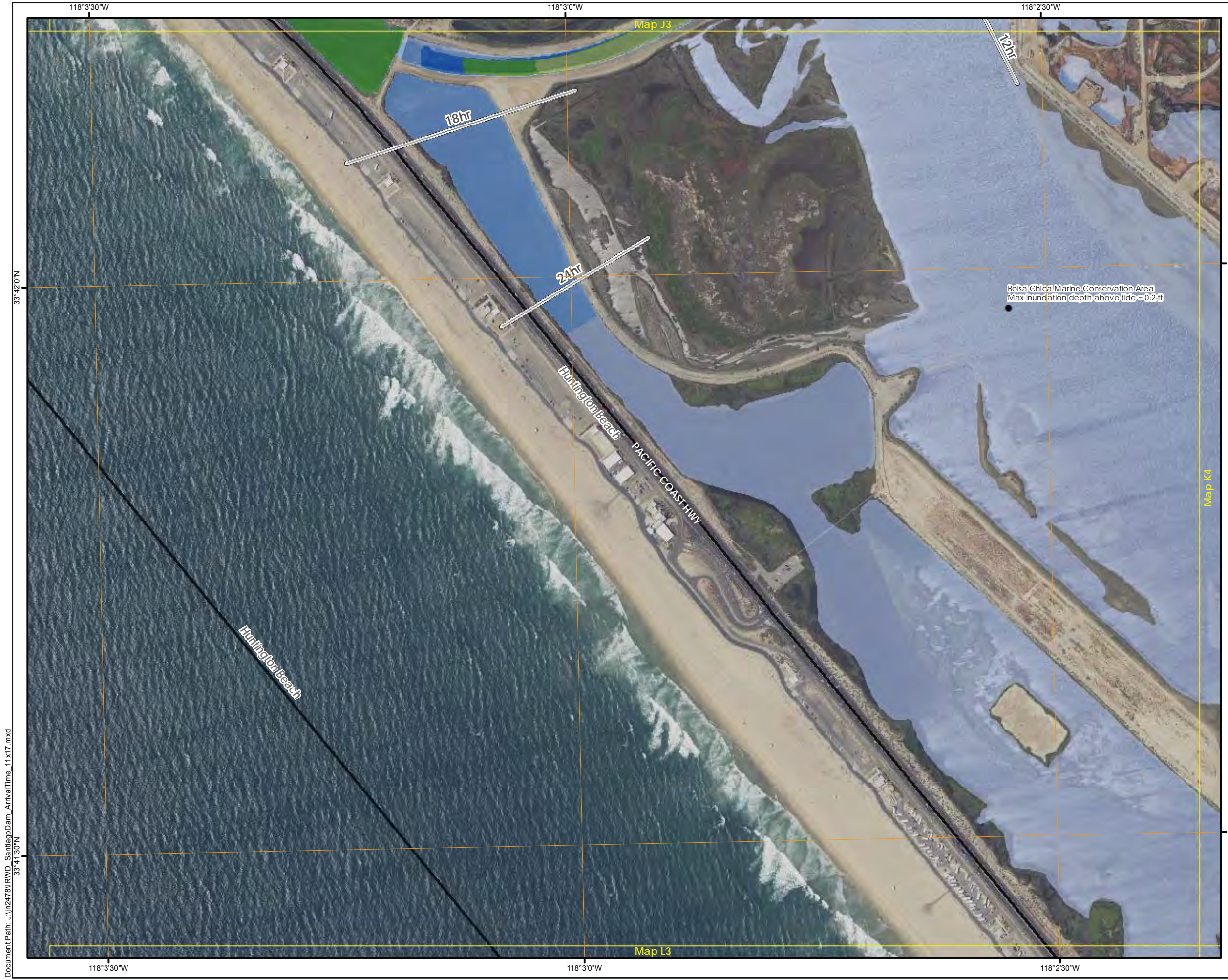
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

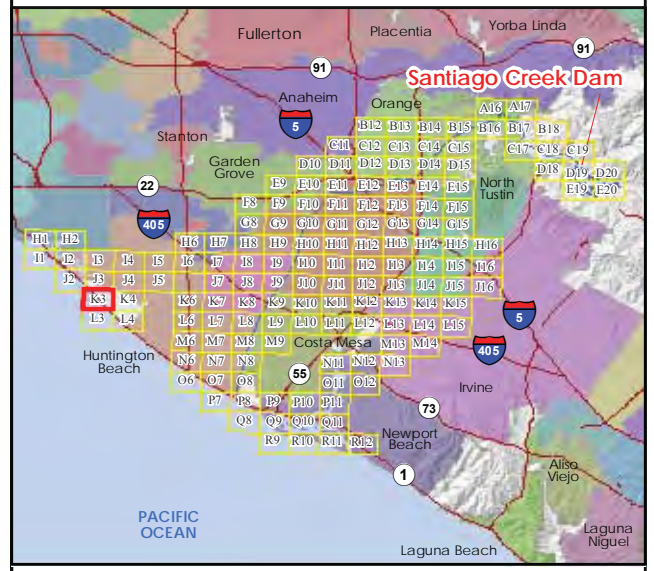
PANEL 94 of 148

**J16**

0 250 500 750 Feet  
0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

Map Panel #	0-1 ft
Dam Crest	1-2 ft
River	2-3 ft
Arrival Time	3-4 ft
City Boundary	4-5 ft
River Mile	5-10 ft
	10-20 ft
	20-30 ft
	30-40 ft
	>40 ft

Maximum Inundation Depth, Sunny Day Failure

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 95 of 148

**K3**

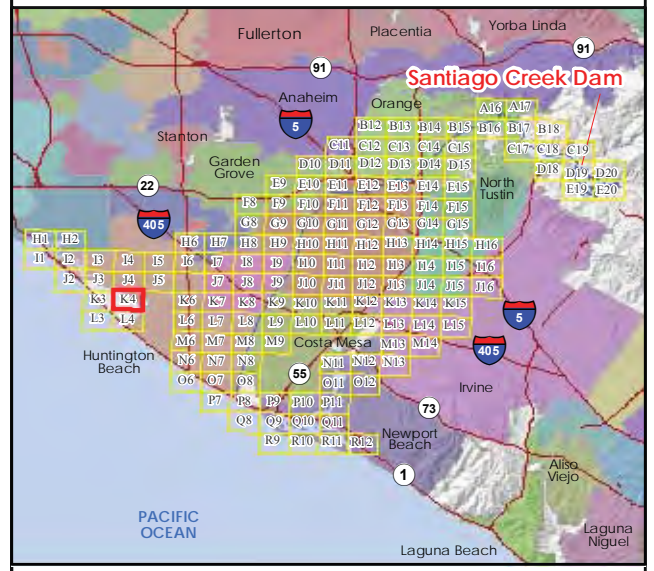
N

Feet

Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 96 of 148

**K4**

N

0 100 200 Meters

117°59'30"W

117°59'0"W

33°42'0"N

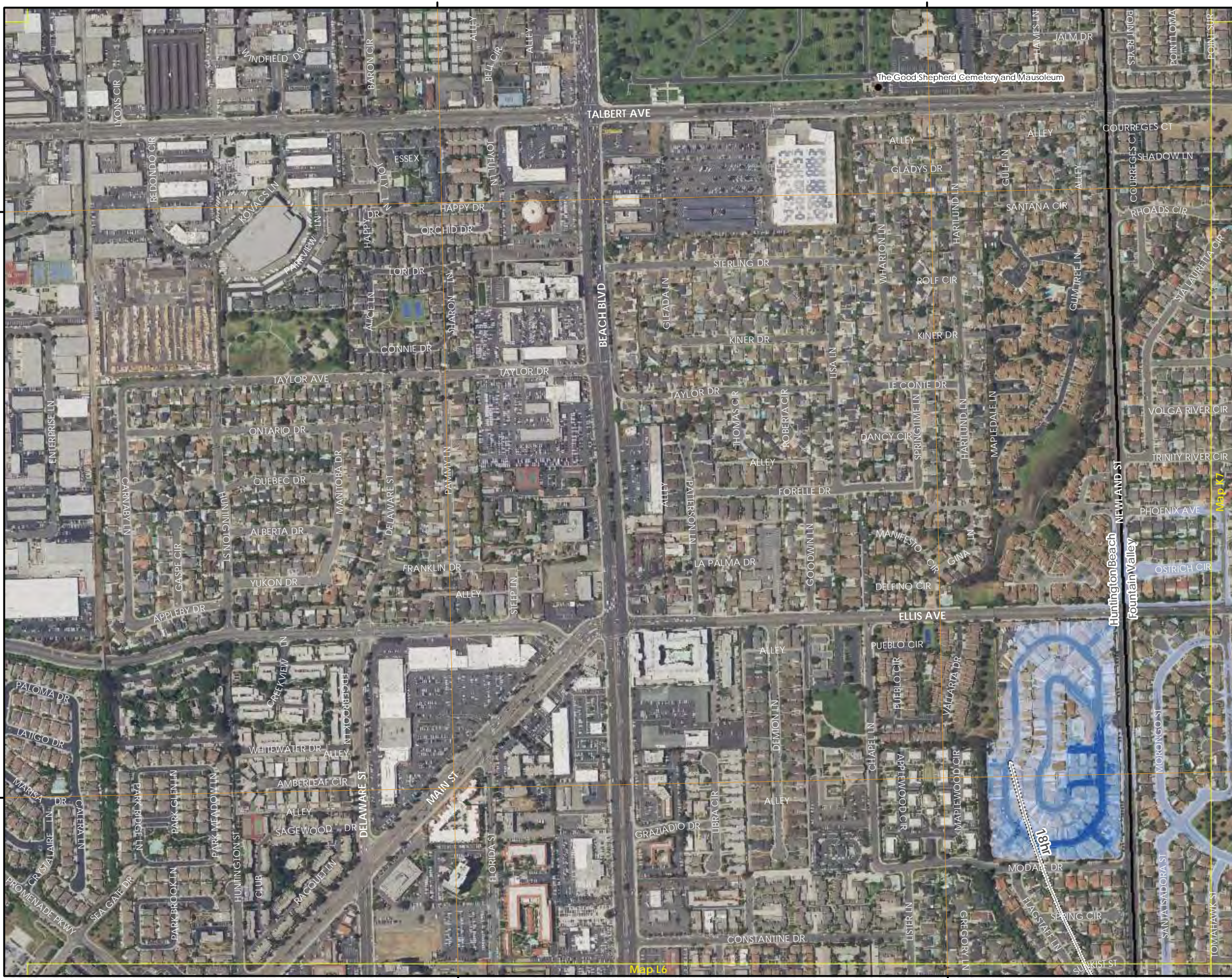
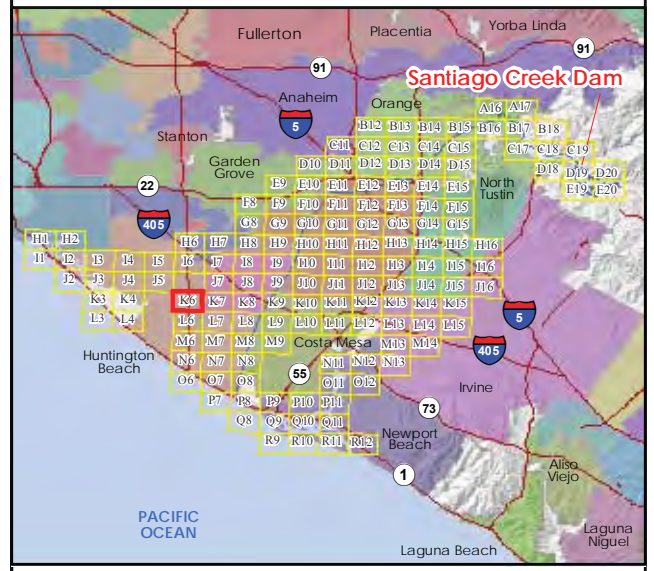
33°42'0"N

33°41'30"N

117°59'30"W

117°59'0"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 97 of 148**

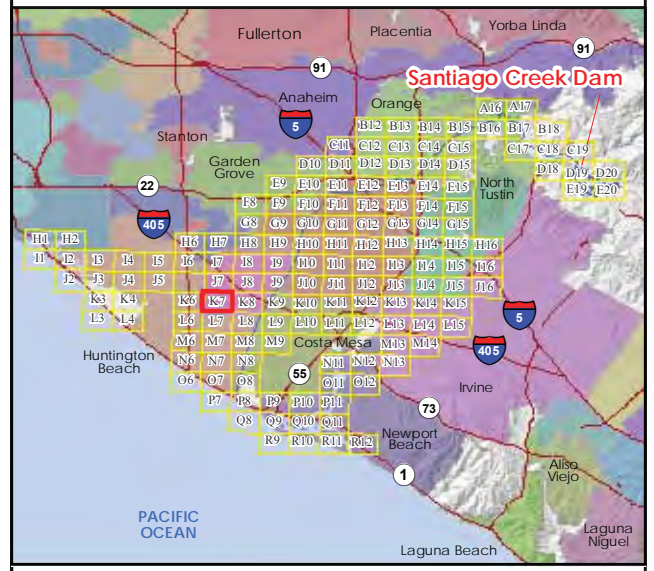
**K6**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

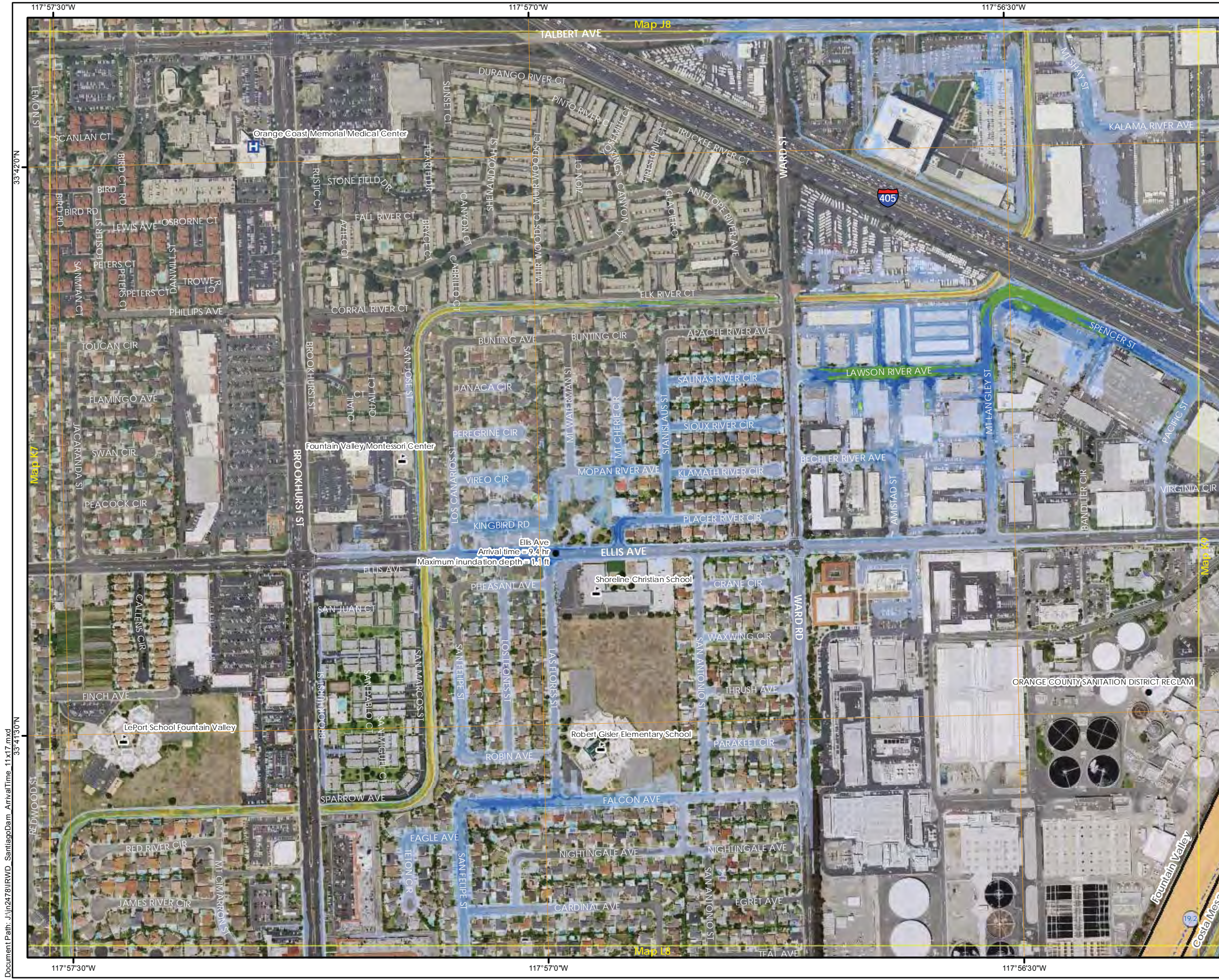
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 98 of 148

**K7**

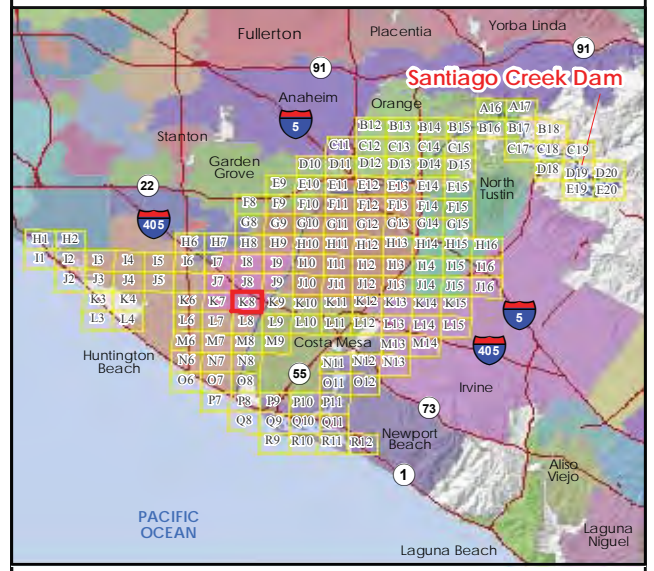
0 250 500 750 Feet

0 100 200 Meters



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 99 of 148

**K8**

N

0 250 500 750 Feet

0 100 200 Meters

Document Path: \\jlm2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd 33°41'30"N 117°57'30"W

33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W

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33°41'30"N 117°57'0"W

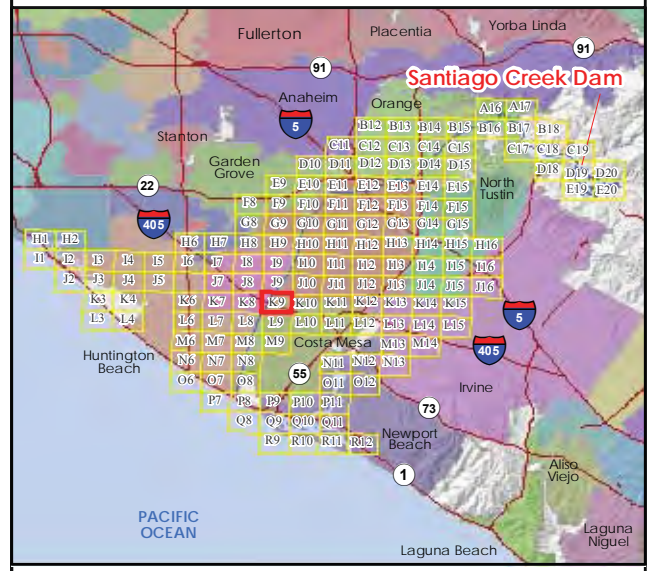
33°42'0"N 117°56'30"W

33°41'30"N 117°57'0"W

33°42'0"N 117°56'30"W



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Civil Engineer 71788  
Expiration Date December 31, 2019

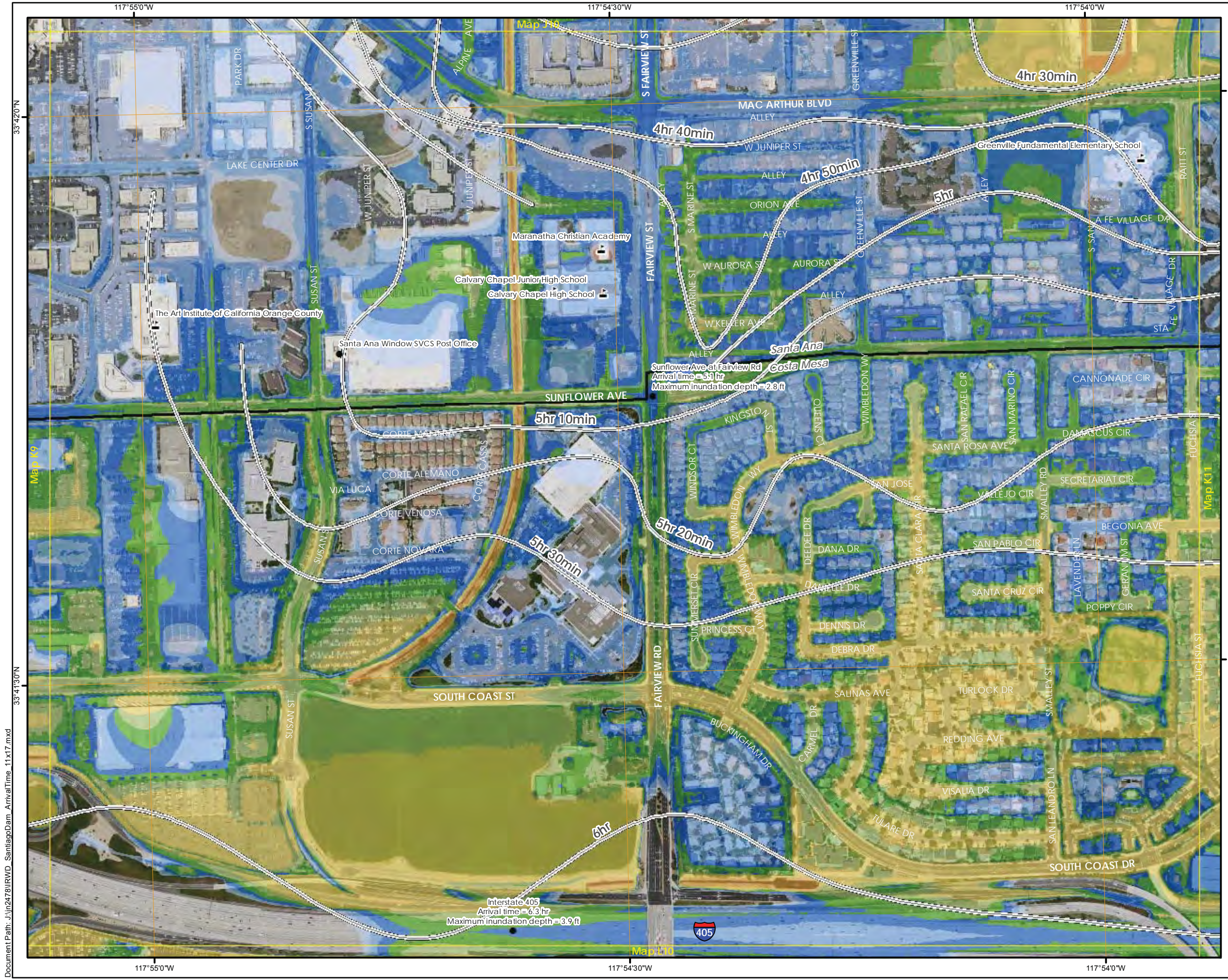
REGISTERED PROFESSIONAL ENGINEER  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

PANEL 100 of 148

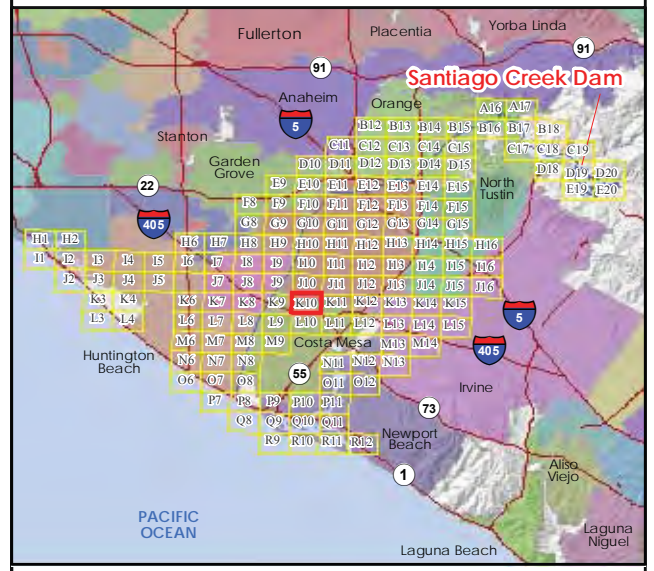
**K9**

0 250 500 750  
Feet

0 100 200  
Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

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Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 101 of 148

**N**

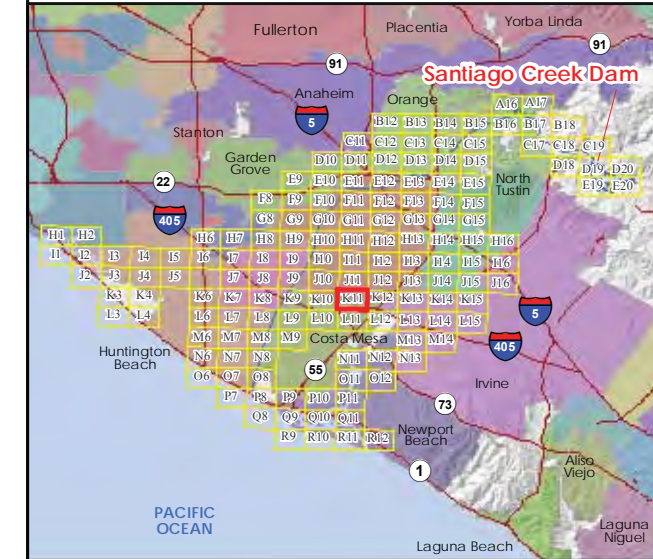
**K10**

0 250 500 750  
Feet

0 100 200  
Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- Fire Station

**Maximum Inundation Depth,  
Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

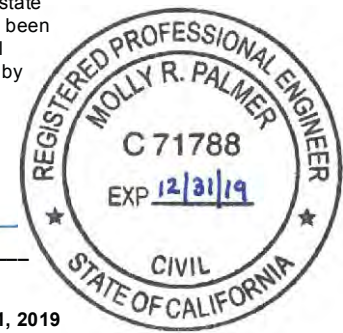
1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

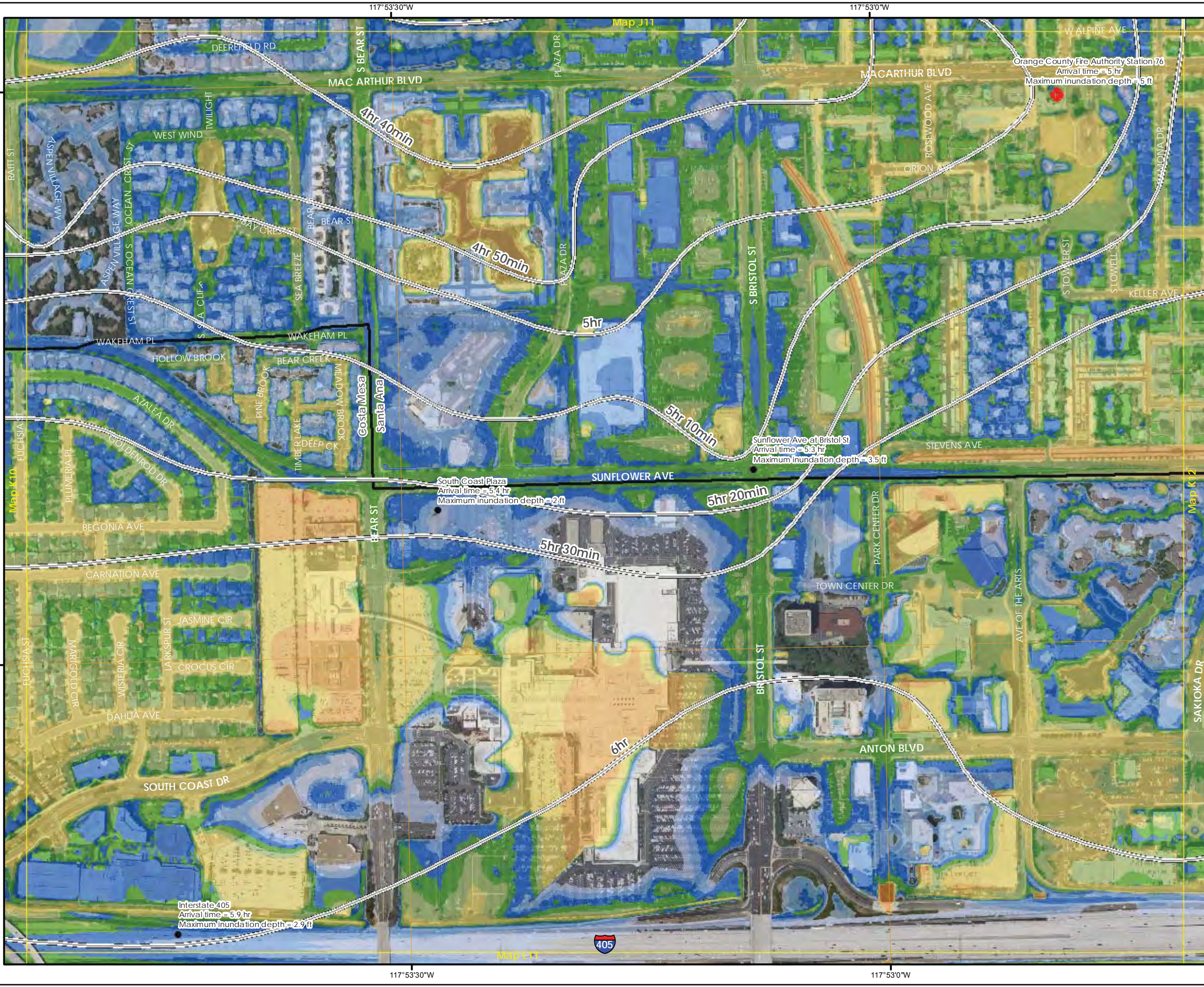
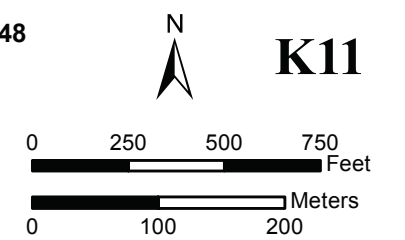
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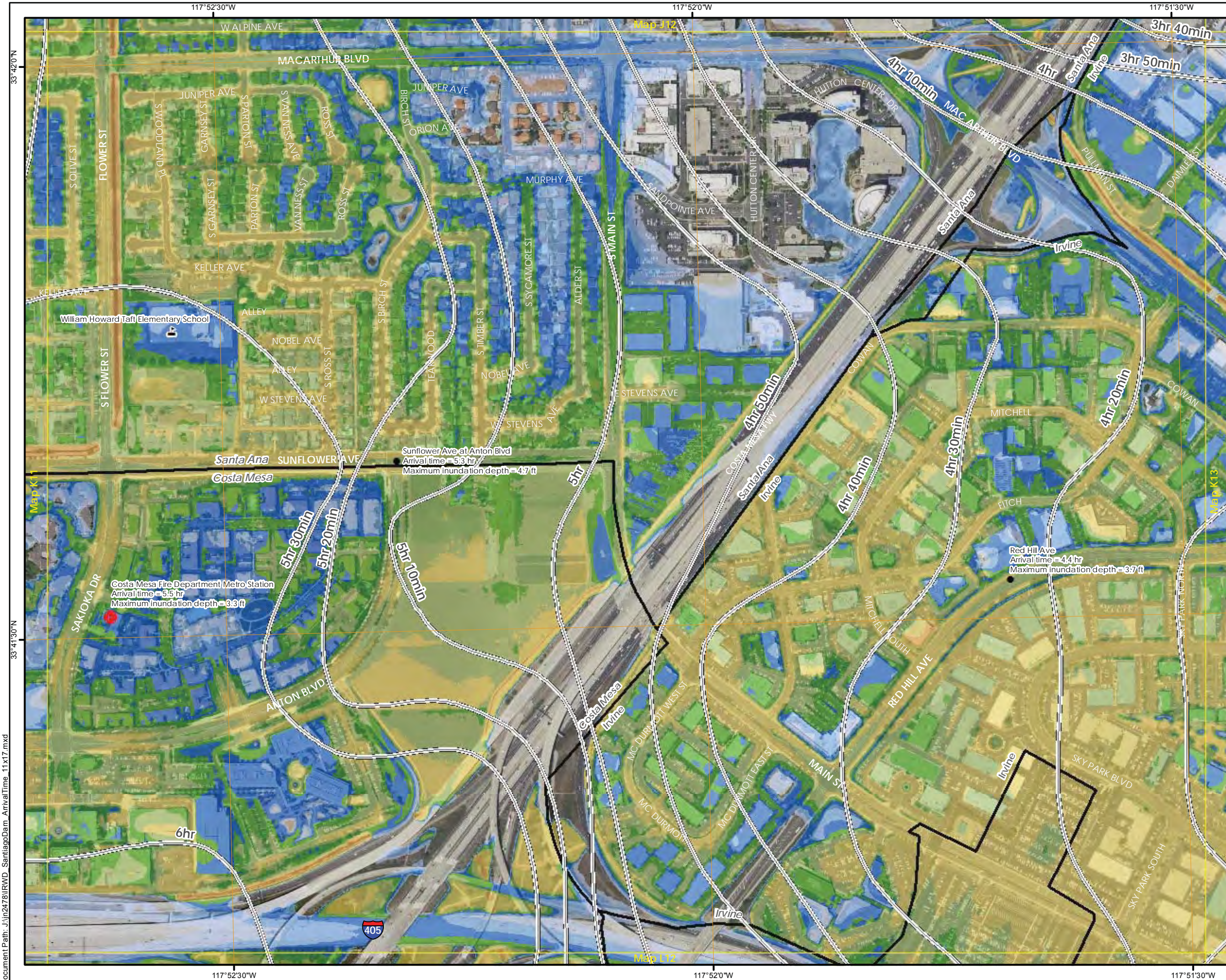
*Molly Palmer*

Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



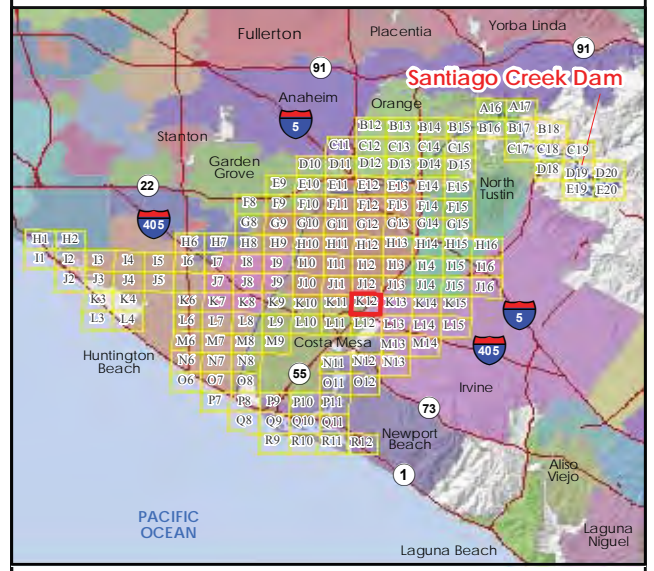
PANEL 102 of 148





# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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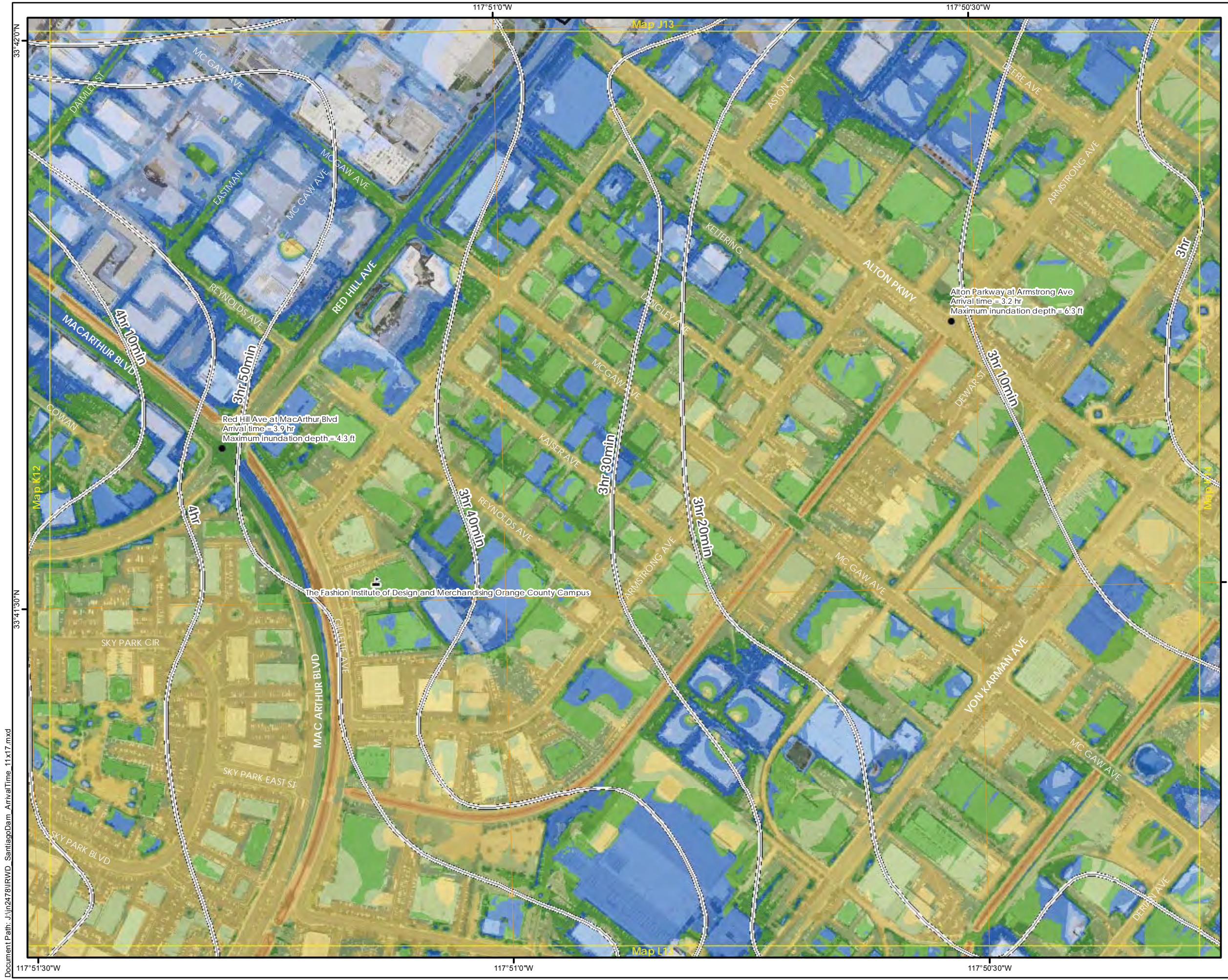
**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

PANEL 103 of 148

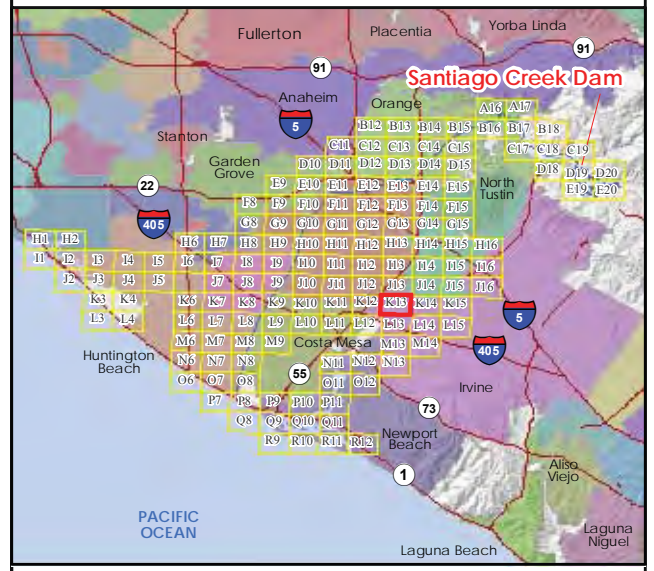
**K12**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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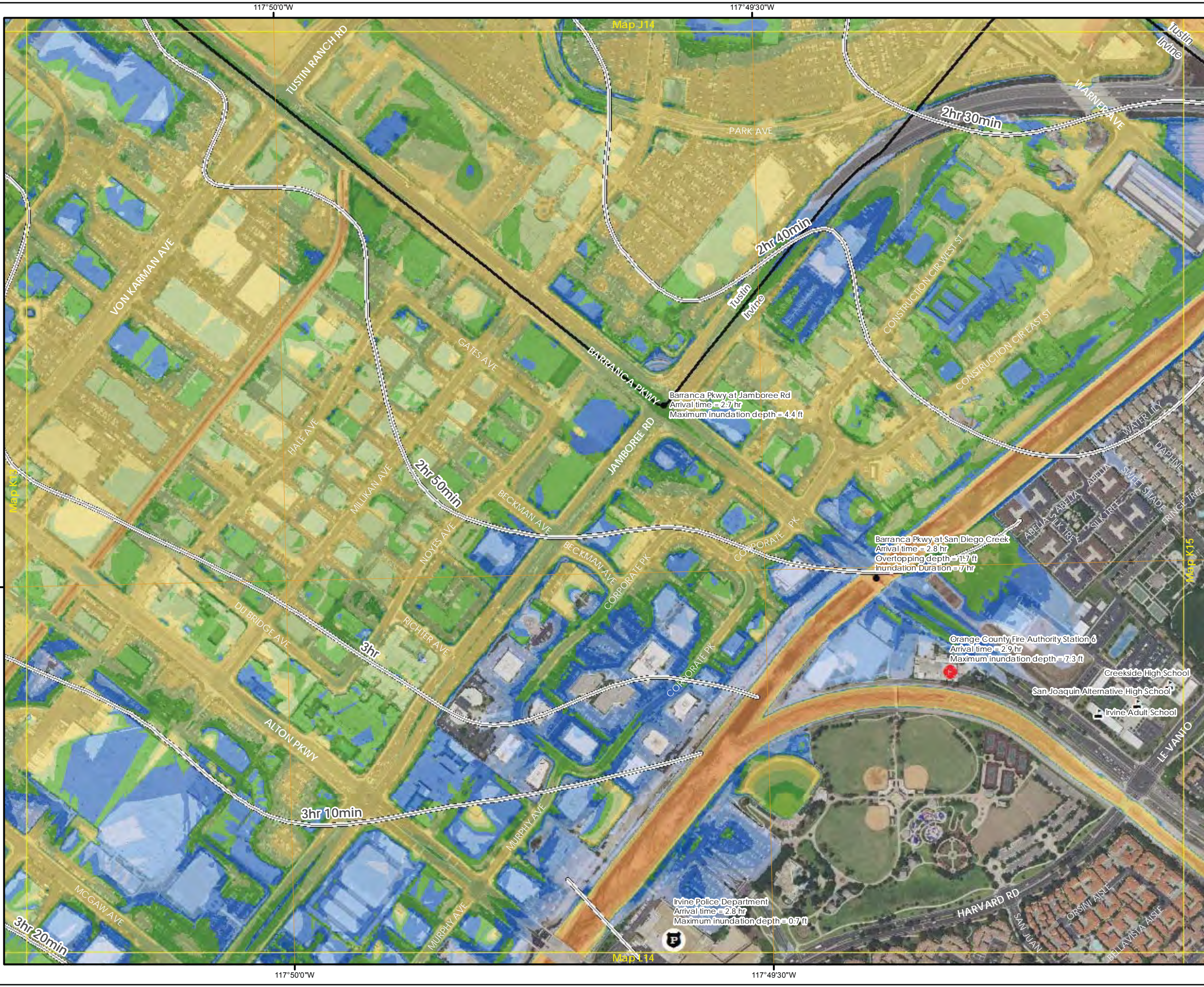
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

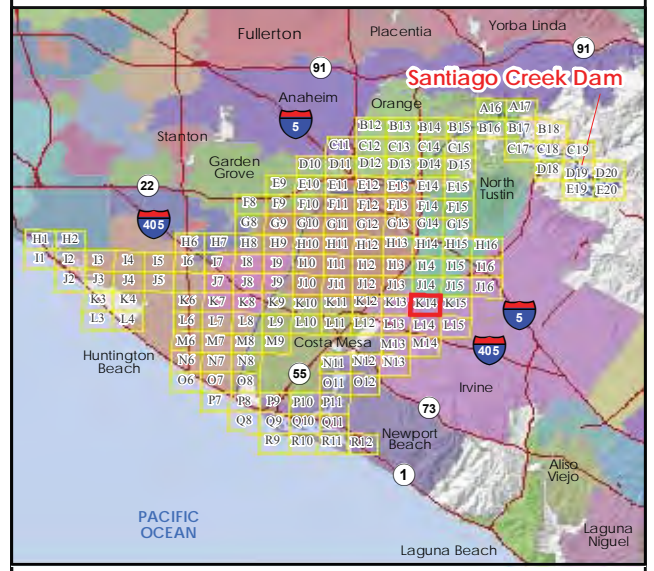
PANEL 104 of 148

**K13**

**STETSON  
ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station
- Police Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Expiration Date December 31, 2019

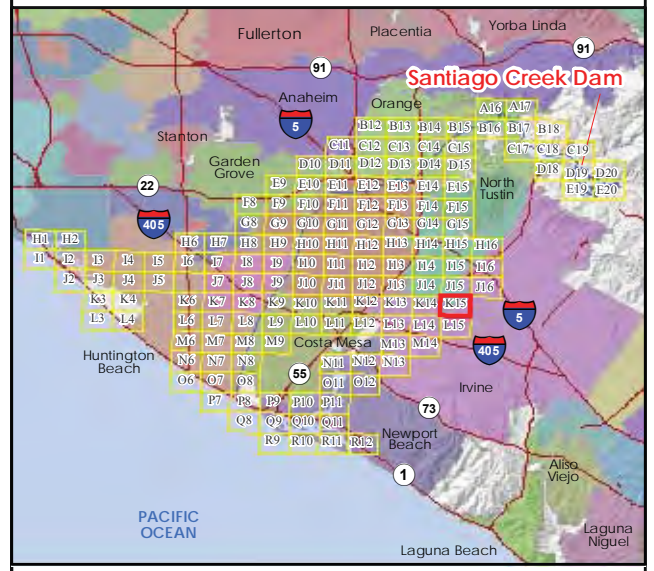
PANEL 105 of 148

**K14**

STETSON  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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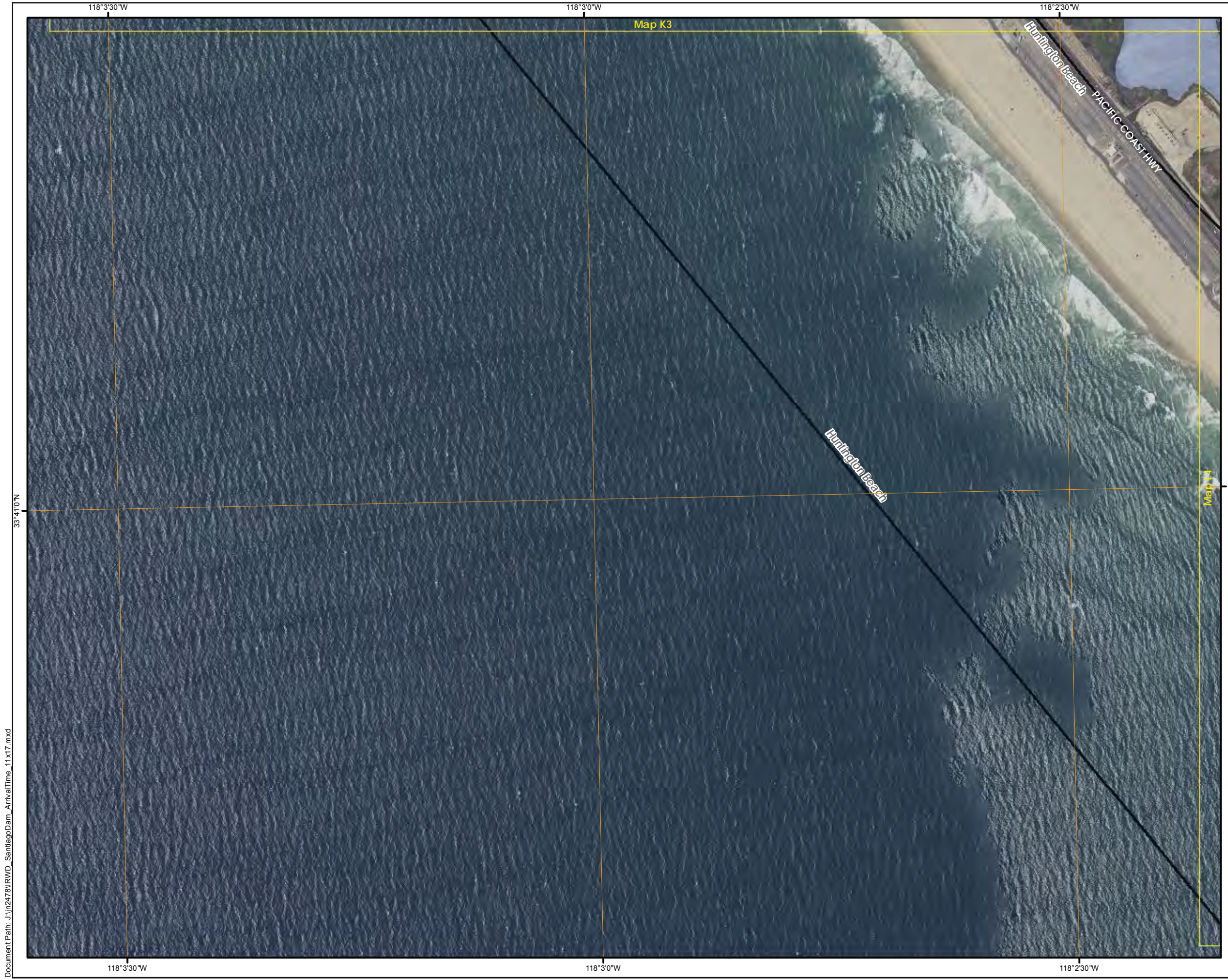
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 106 of 148** **K15**

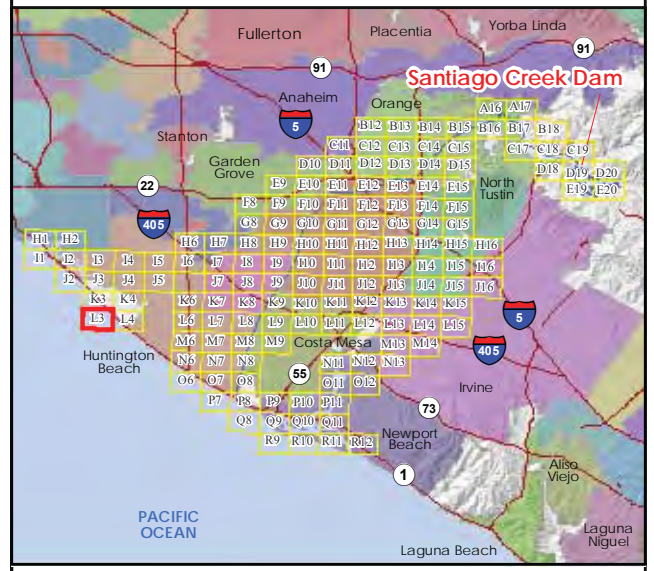
N

Feet

Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 107 of 148** **L3**

**STETSON**  
ENGINEERS INC.

118°20'W

118°130'W

Map K4

Bolsa Chica Marine Conservation Area  
Max inundation depth above tide = 0.1 ft

Map L3

33°41'0"N

33°41'0"N

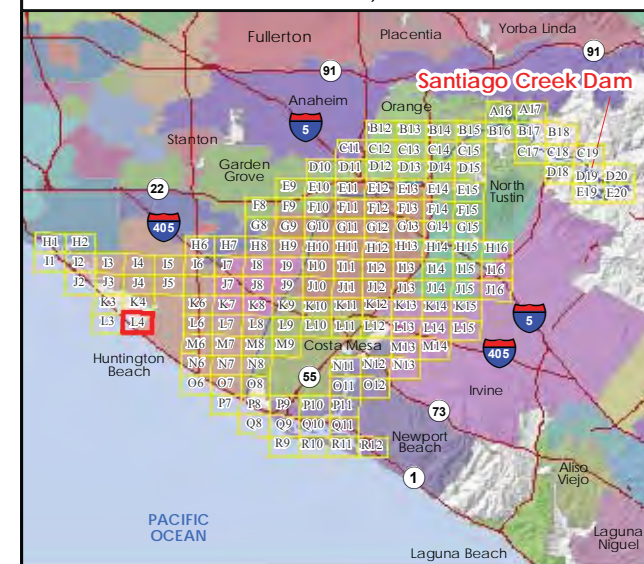
Huntington Beach

118°20'W

118°130'W

# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



### Legend

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

### Maximum Inundation Depth, Sunny Day Failure

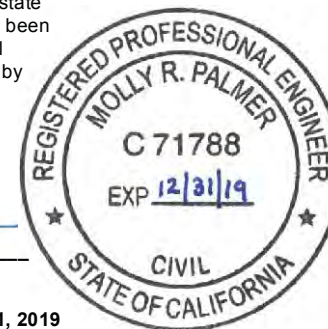
- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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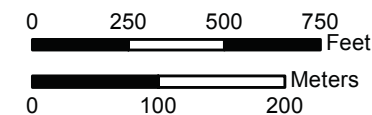
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



PANEL 108 of 148



L4

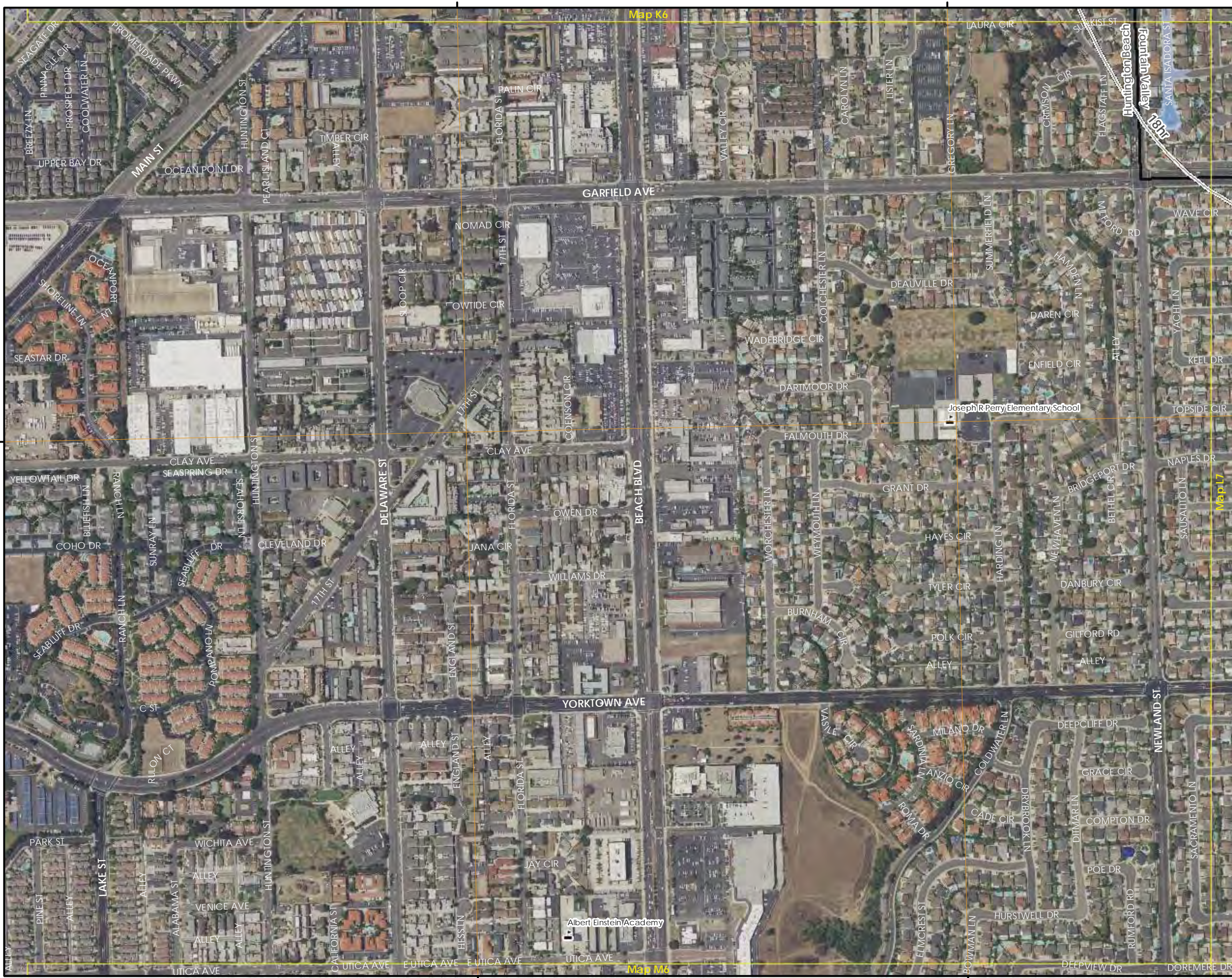


117°59'30"W

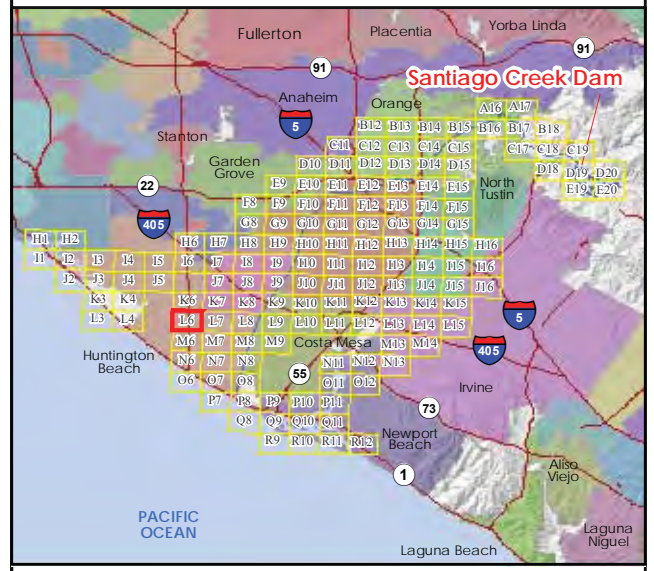
117°59'0"W

Map K6

Map M6



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 109 of 148

**L6**

**STETSON ENGINEERS INC.**

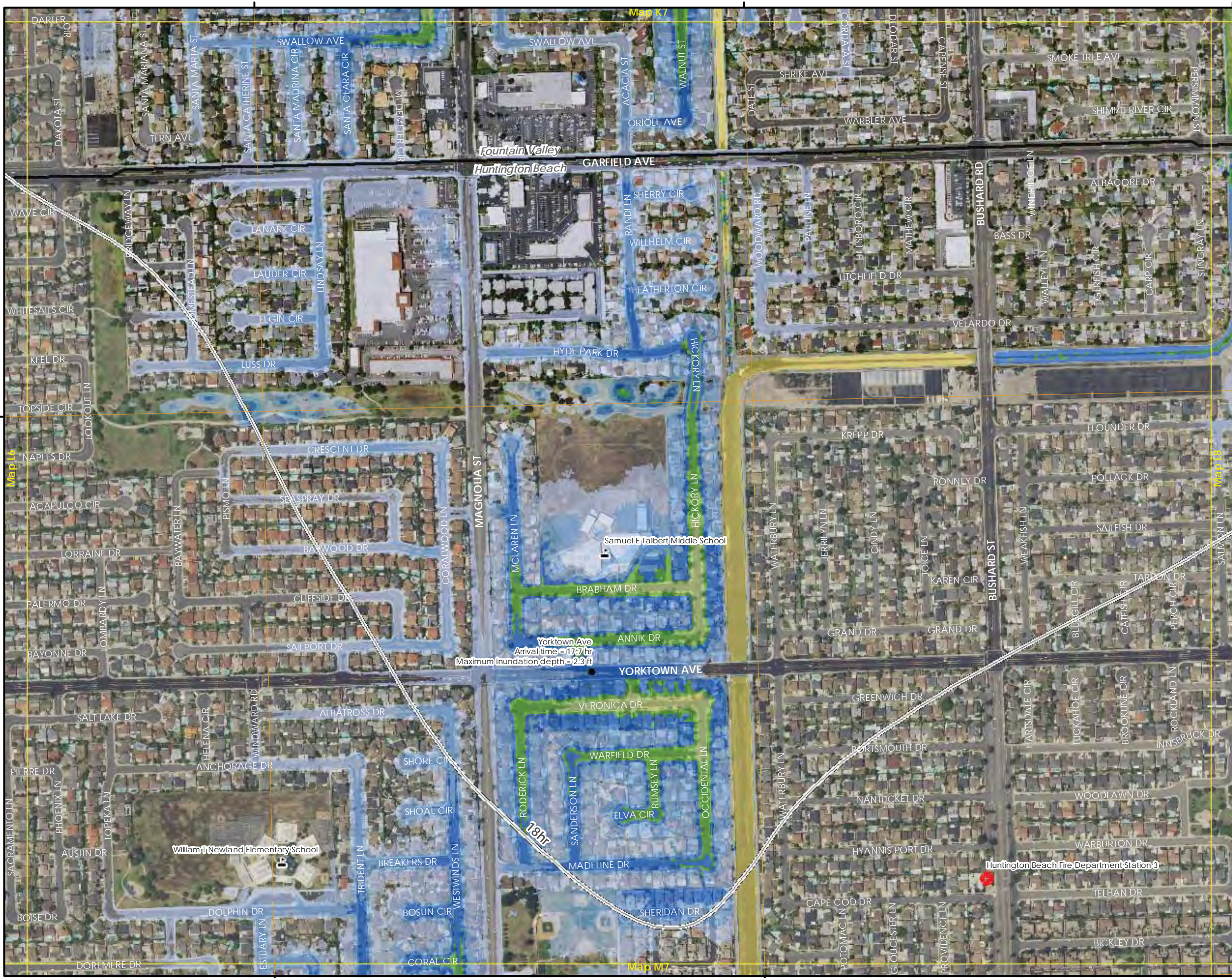
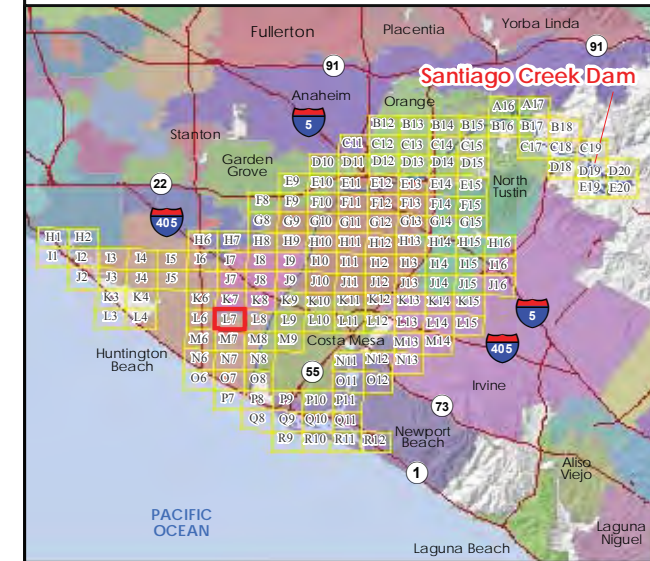


117°58'30"W

117°58'0"W

117°57'30"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

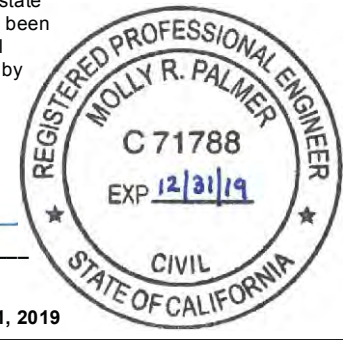
- Map Panel #
  - Dam Crest
  - River
  - Arrival Time
  - City Boundary
  - River Mile
  - School
  - Fire Station
- Maximum Inundation Depth, Sunny Day Failure
- 0-1 ft
  - 1-2 ft
  - 2-3 ft
  - 3-4 ft
  - 4-5 ft
  - 5-10 ft
  - 10-20 ft
  - 20-30 ft
  - 30-40 ft
  - >40 ft

1/26/2018

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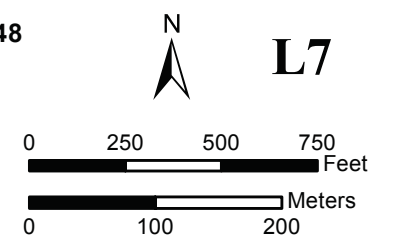
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*



Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 110 of 148

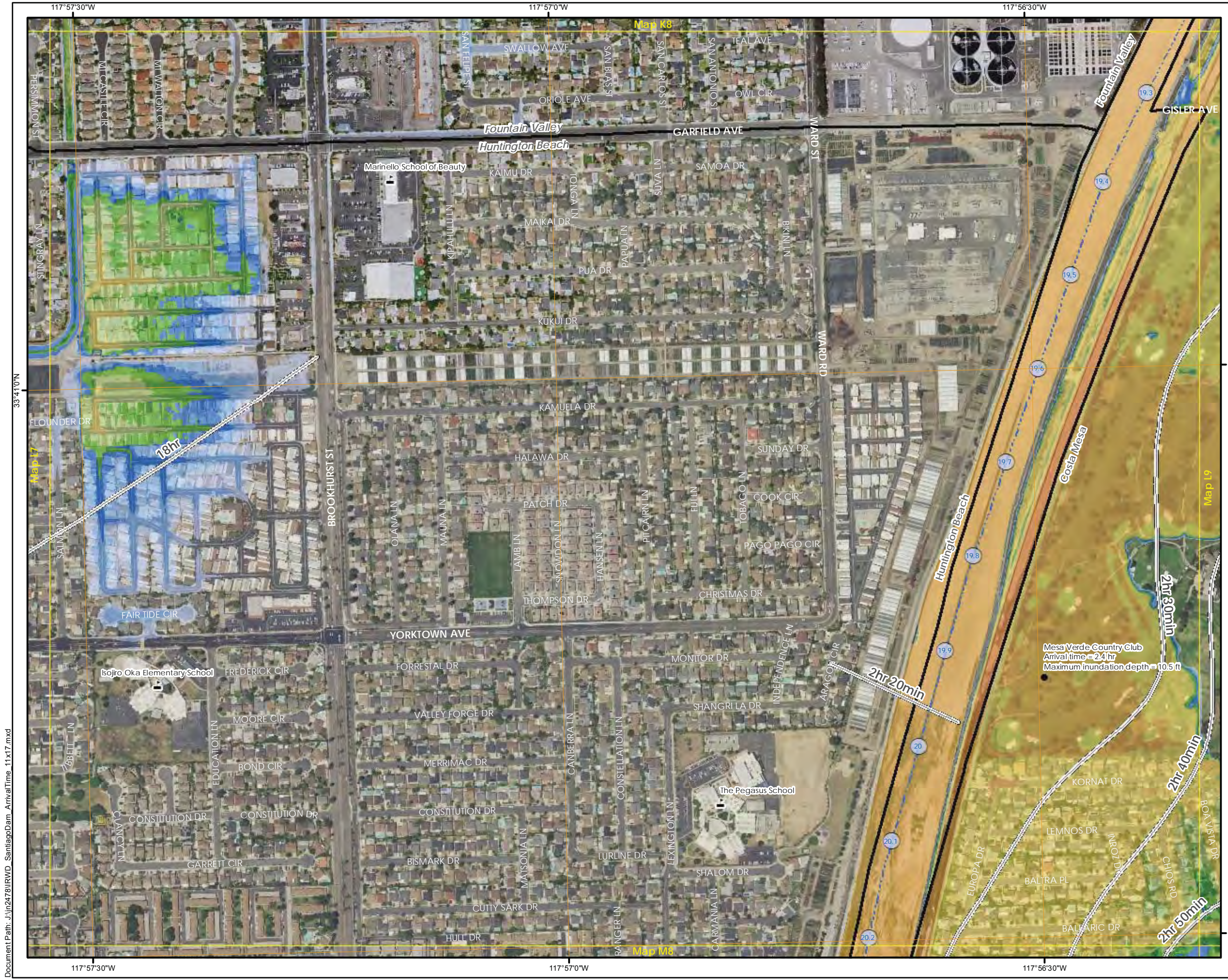


117°58'30"W

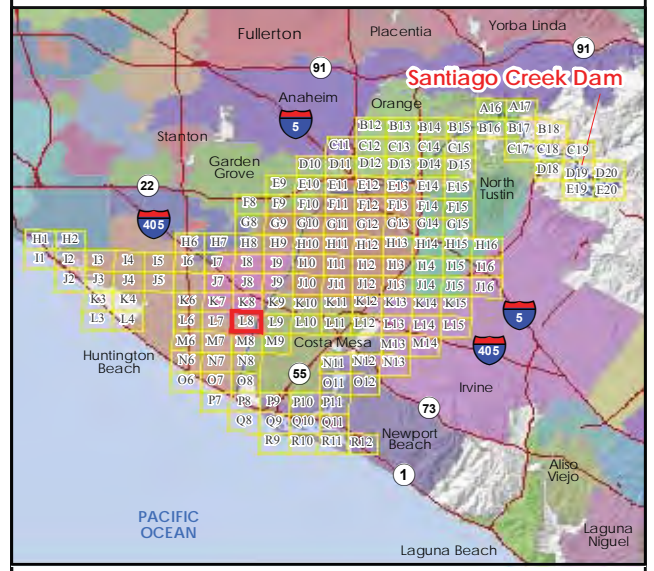
117°58'0"W

33°41'0"N

33°40'30"N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**REGISTERED PROFESSIONAL ENGINEER**  
MOLLY R. PALMER  
C 71788  
EXP 12/31/19  
CIVIL  
STATE OF CALIFORNIA

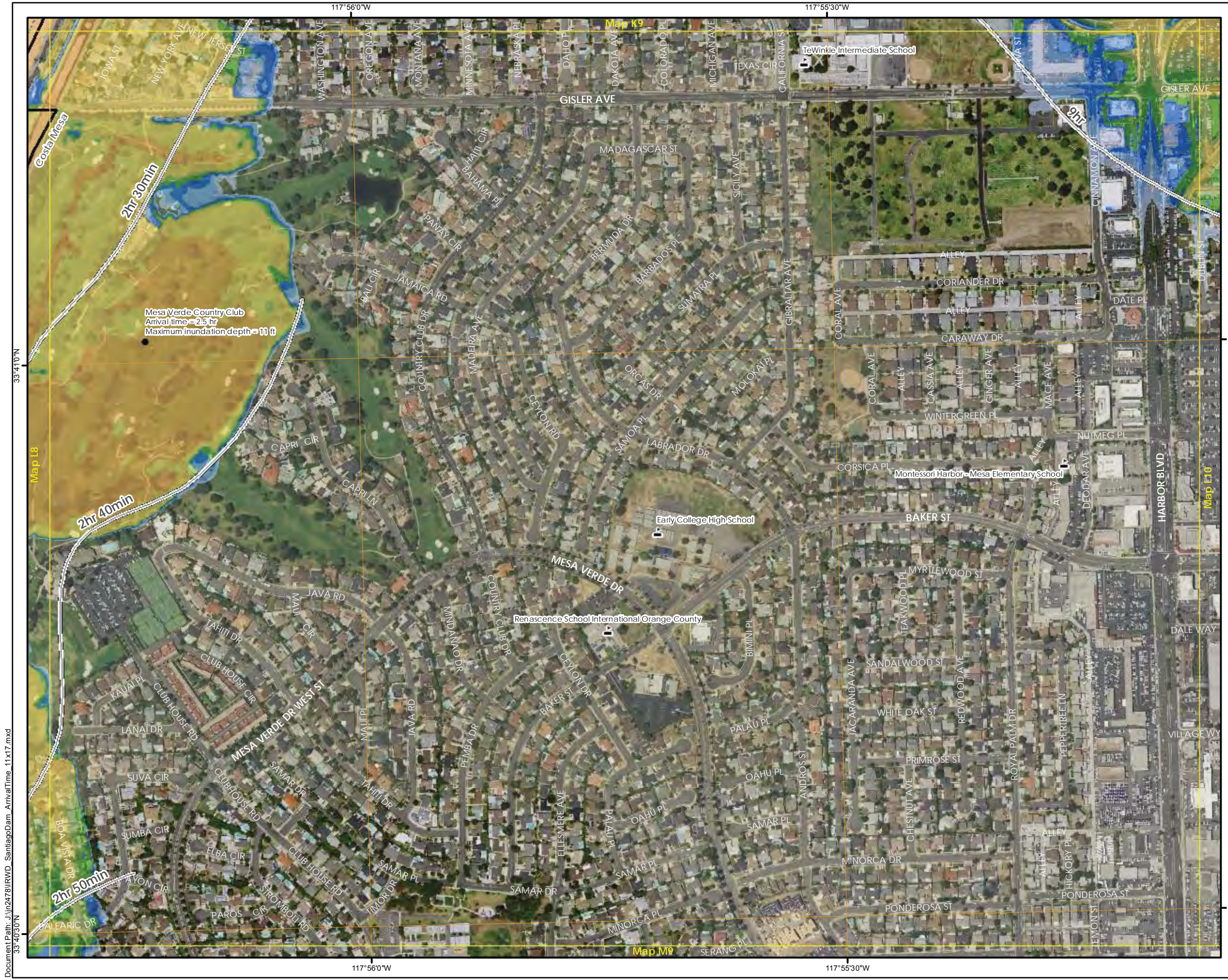
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 111 of 148

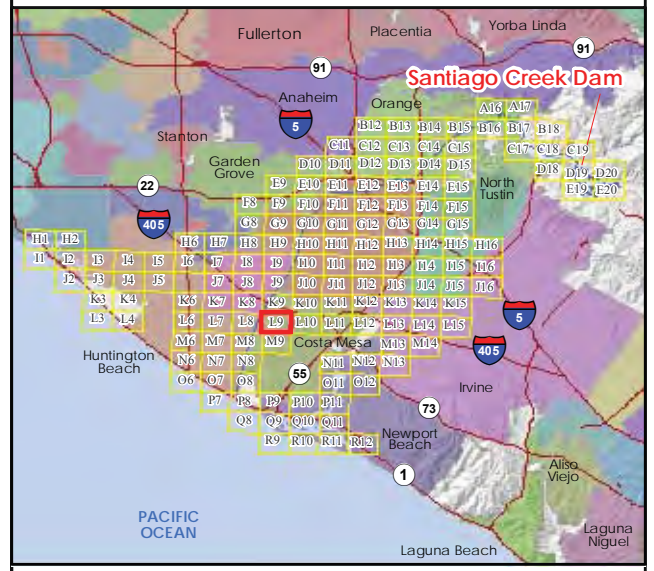
**STETSON ENGINEERS INC.**

0 250 500 750 Feet  
0 100 200 Meters

**L8**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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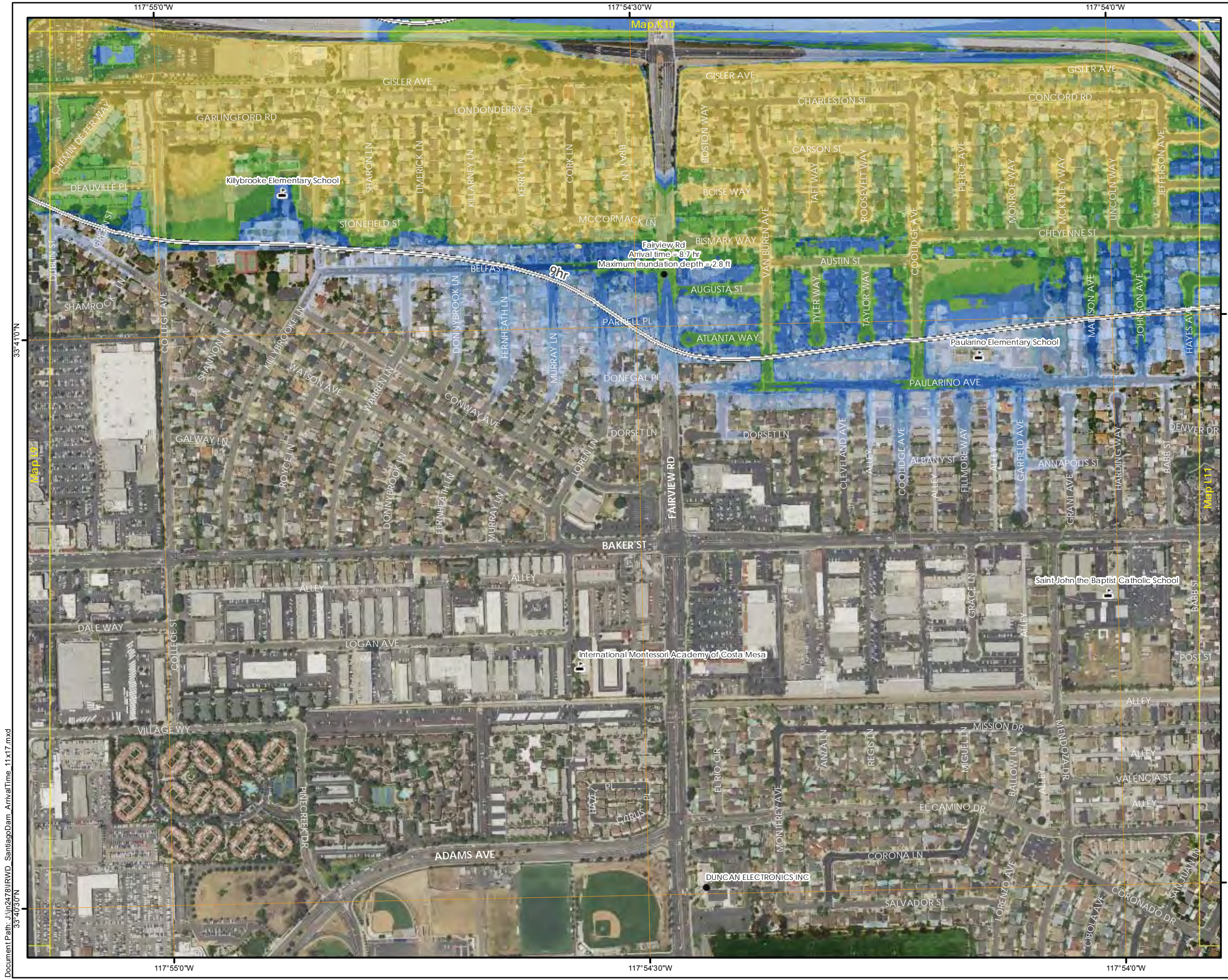
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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

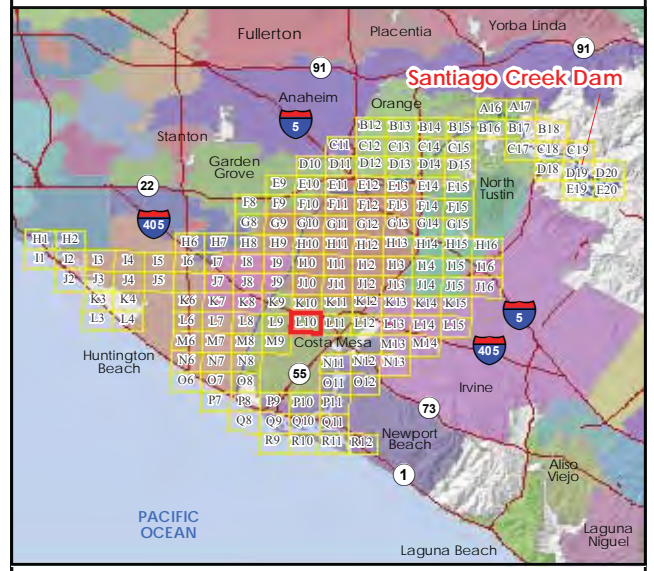
**PANEL 112 of 148**

**N**

**L9**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 113 of 148**

**L10**

117°53'30"W

117°53'0"W

117°53'30"W

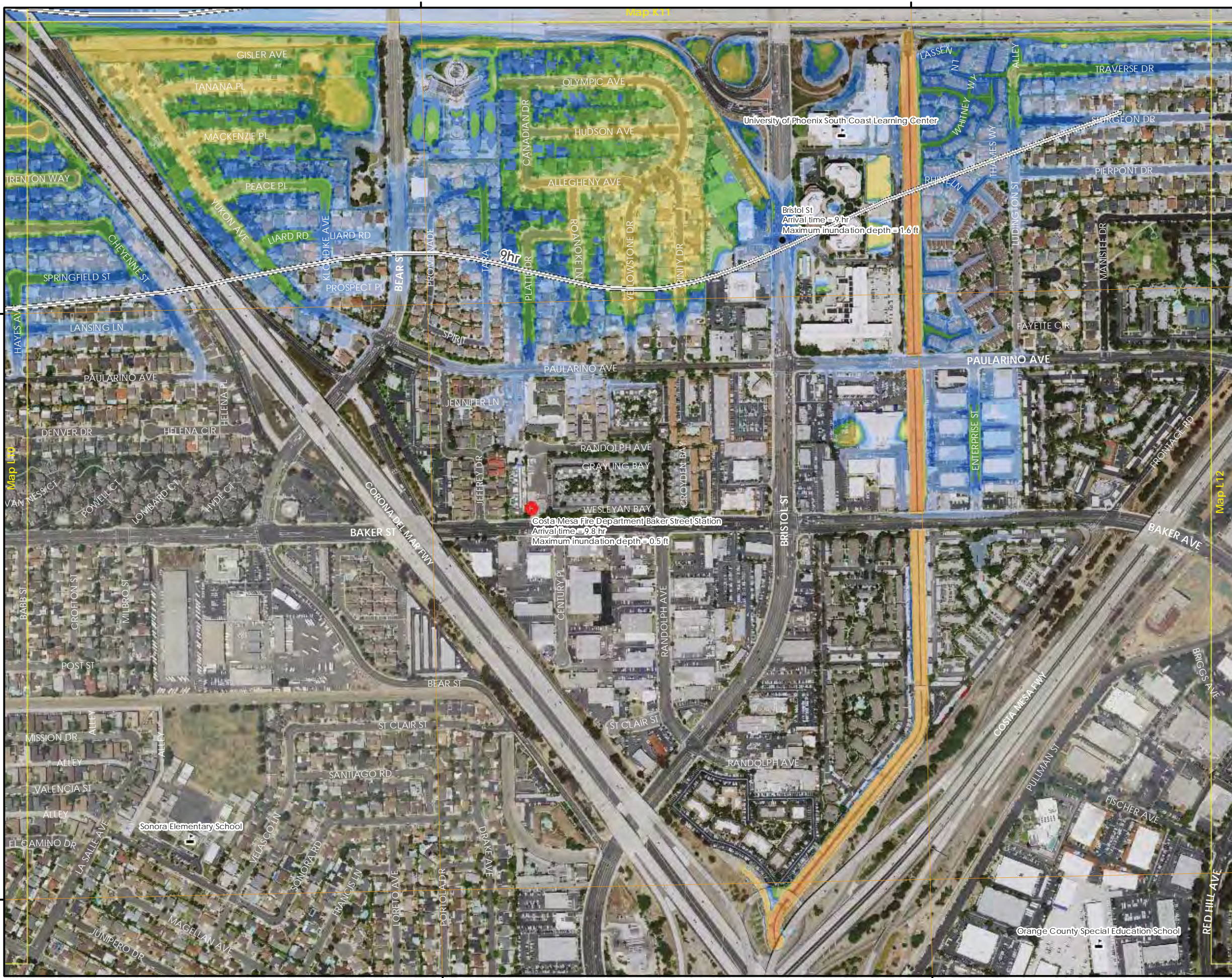
117°53'0"W

33°41'0"N

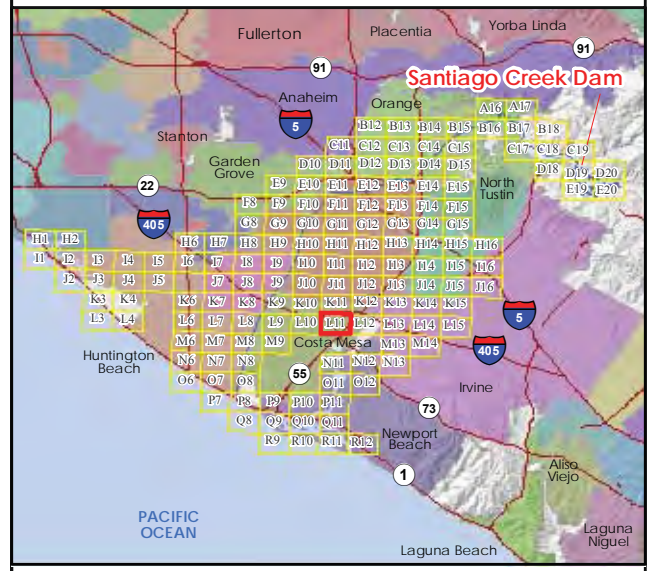
33°41'0"N

33°40'30"N

33°40'30"N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

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Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 114 of 148

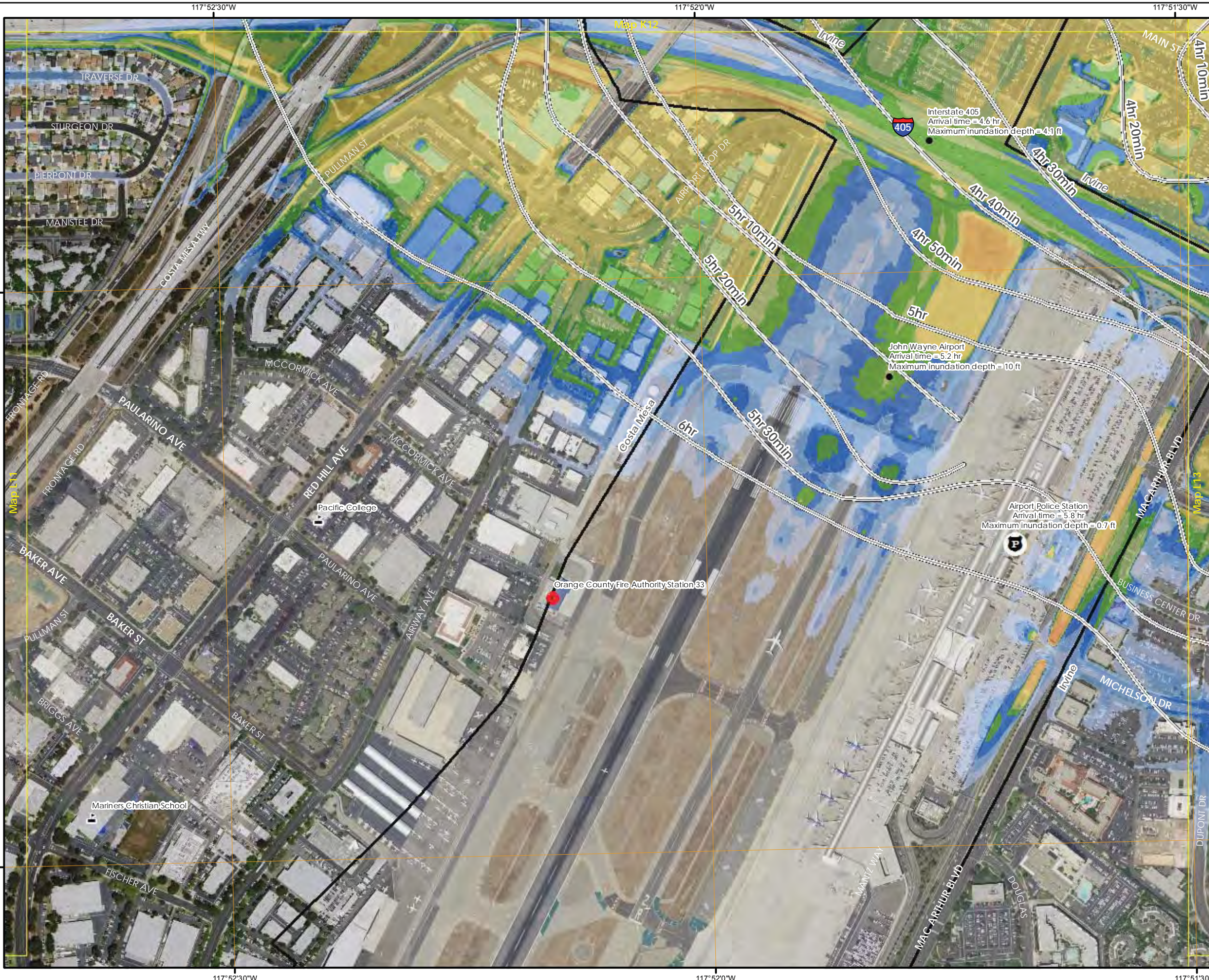
**L11**

0 250 500 750

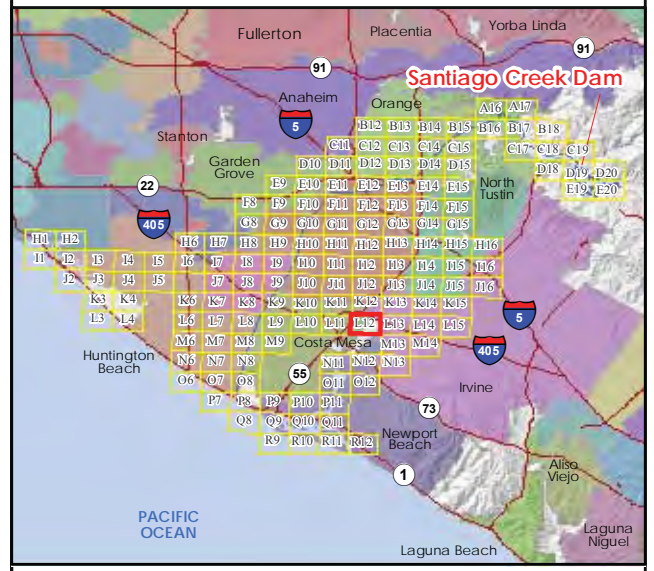
Feet

0 100 200

Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station
- Police Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Expiration Date December 31, 2019

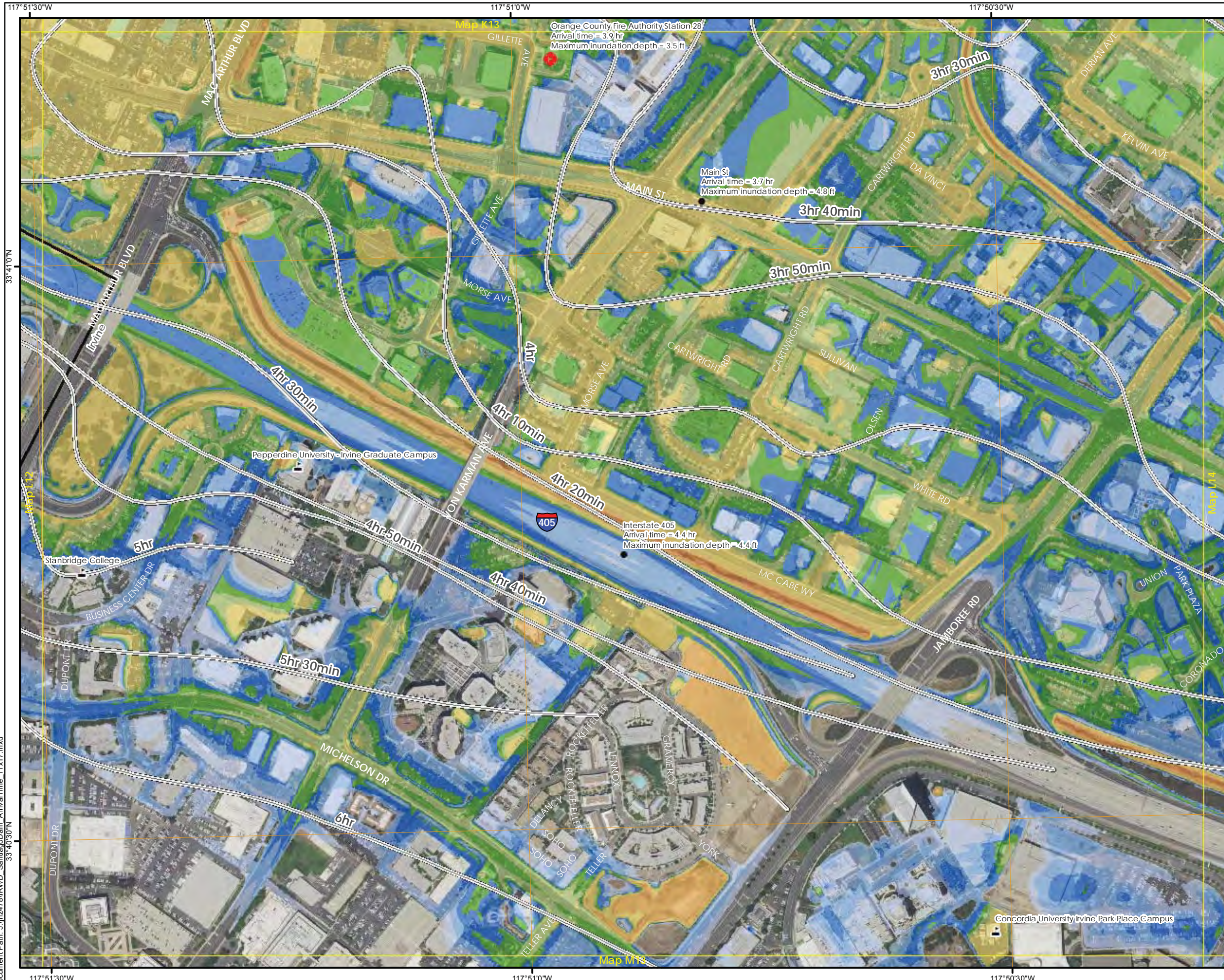
PANEL 115 of 148

**L12**

0 250 500 750 Feet

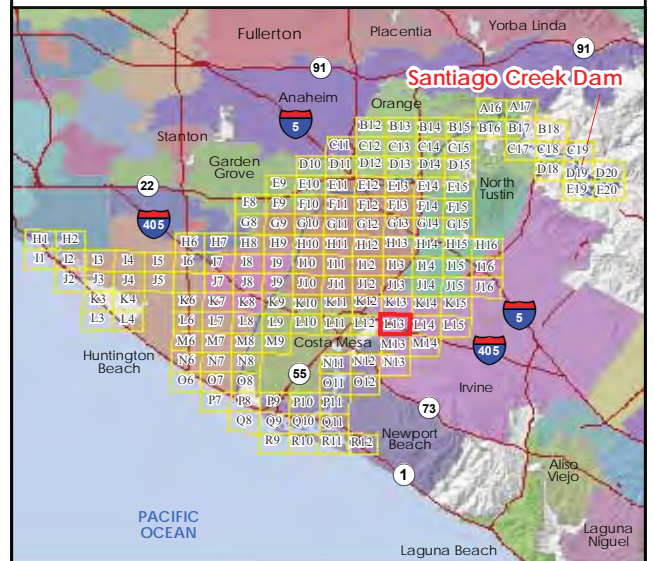
0 100 200 Meters

N



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- Ⓜ School
- F Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

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Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

**PANEL 116 of 148** L13

N

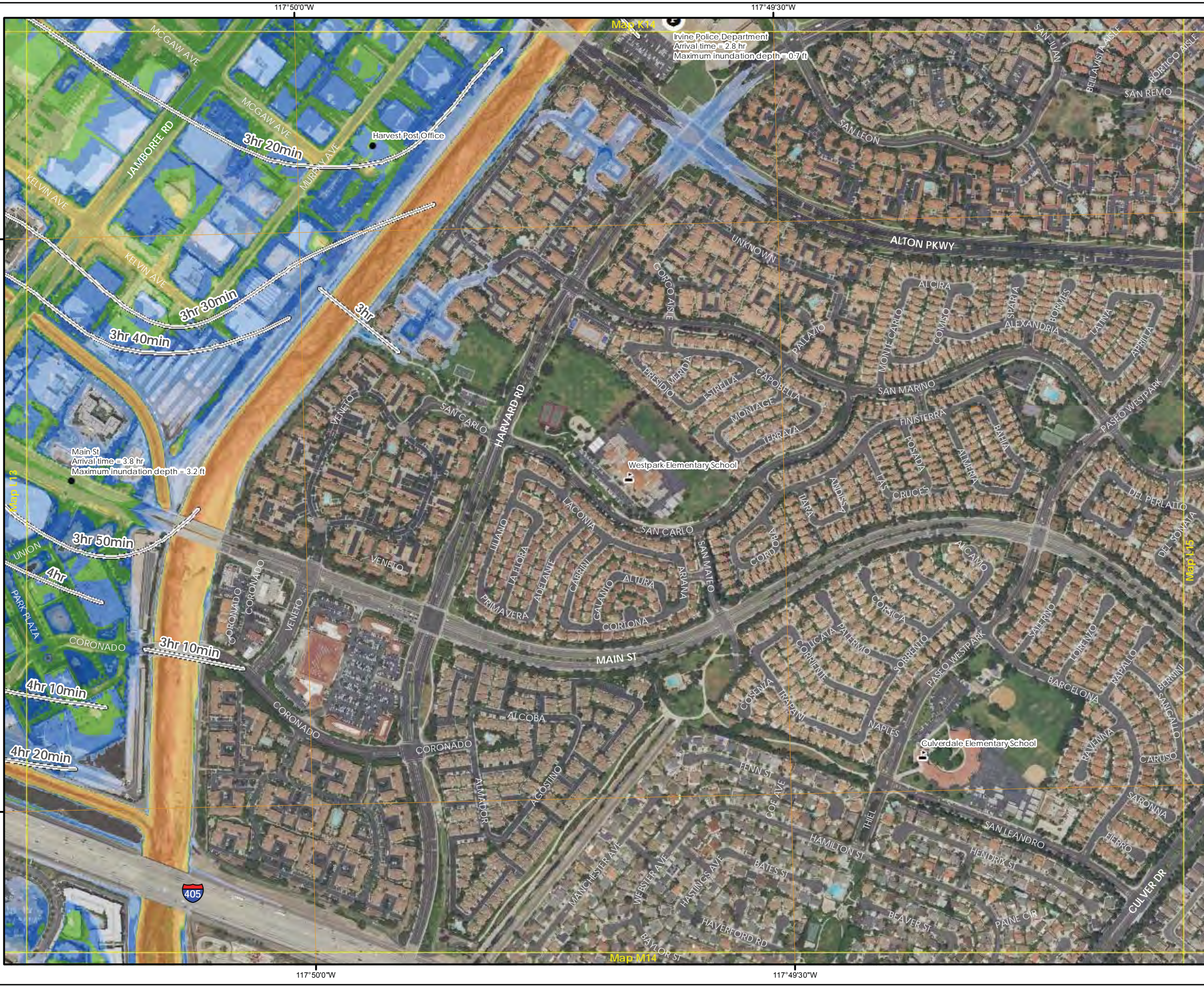
0 250 500 750

Feet

0 100 200

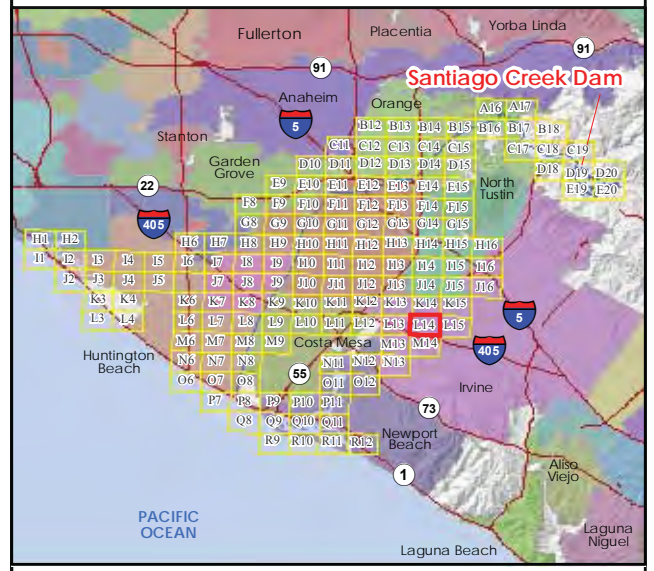
Meters

Document Path: J:\m2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd  
33°40'30"N



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Police Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

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Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 117 of 148

**L14**

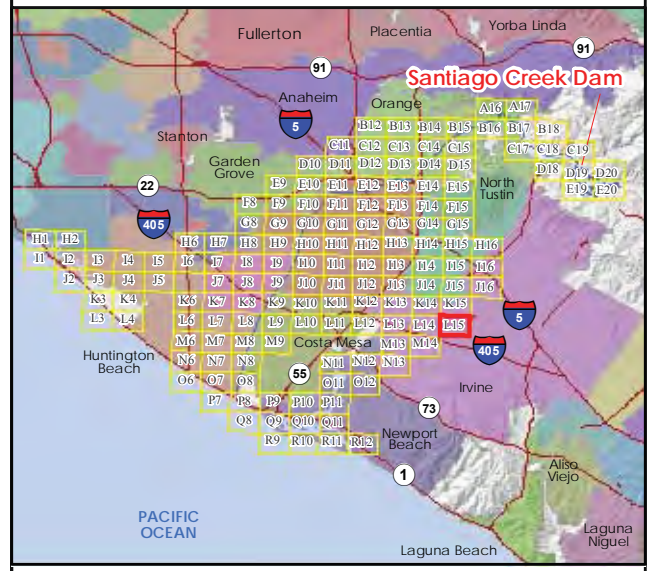
**STETSON**  
ENGINEERS INC.

117°50'0"W 117°49'30"W





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 118 of 148

**L15**

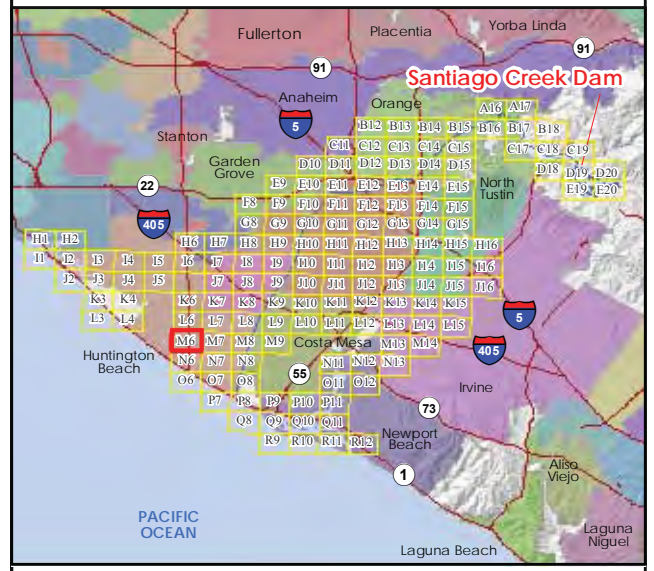
N

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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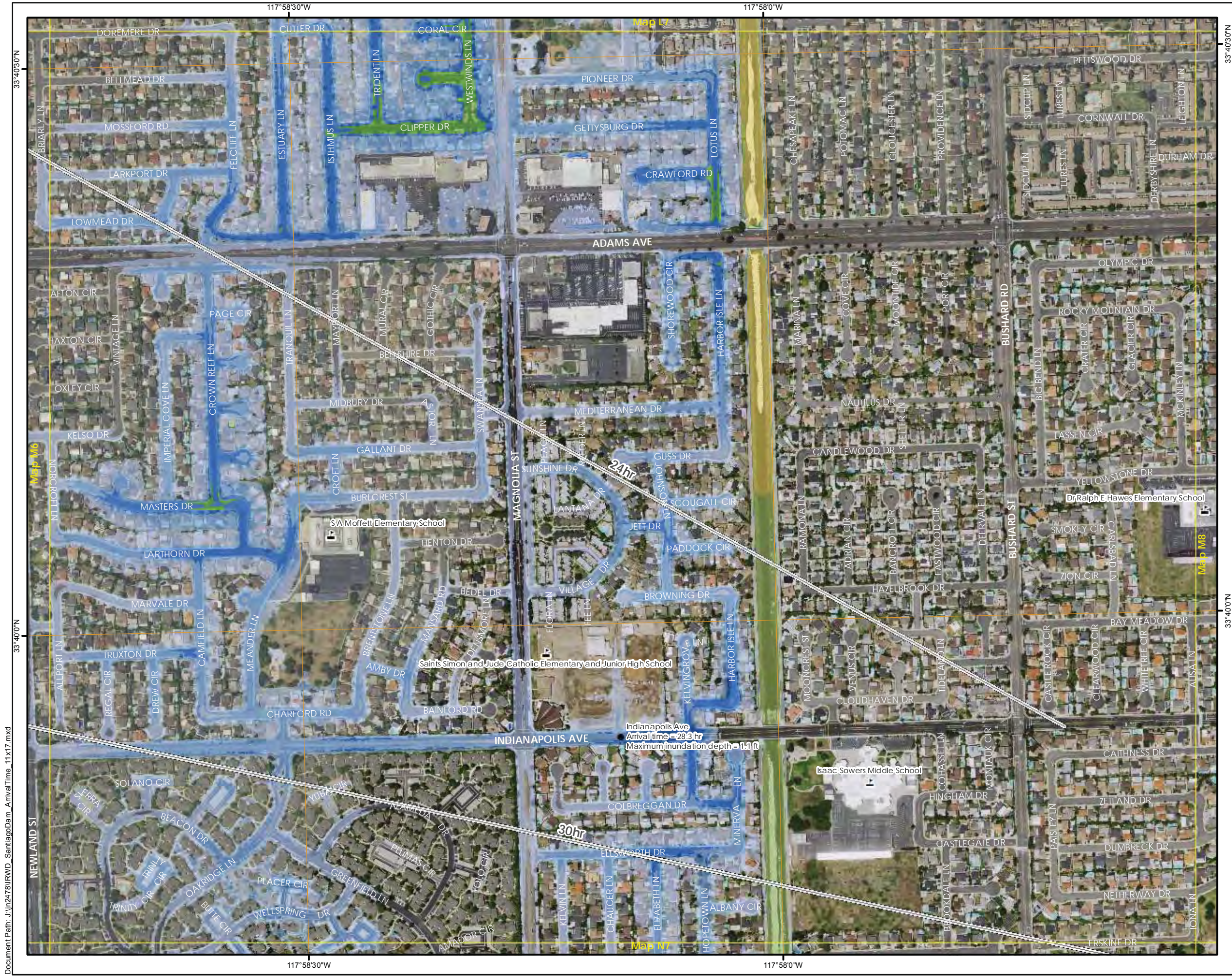
PANEL 119 of 148

**STETSON**  
ENGINEERS INC.

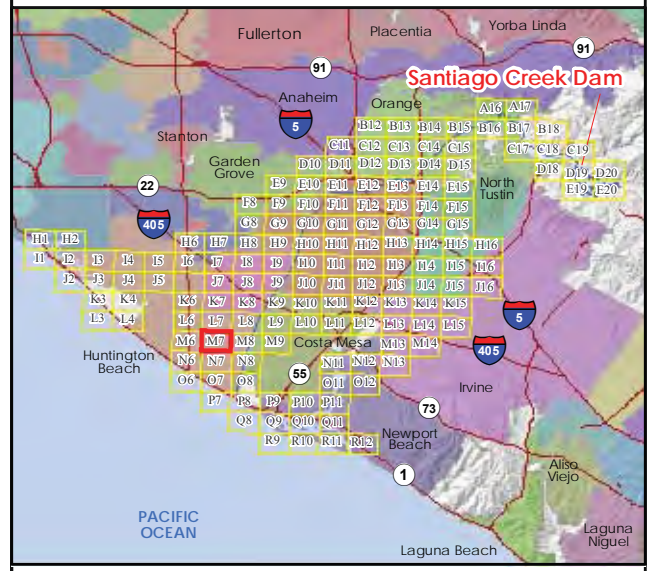
0 250 500 750 Feet

0 100 200 Meters

**M6**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 120 of 148**

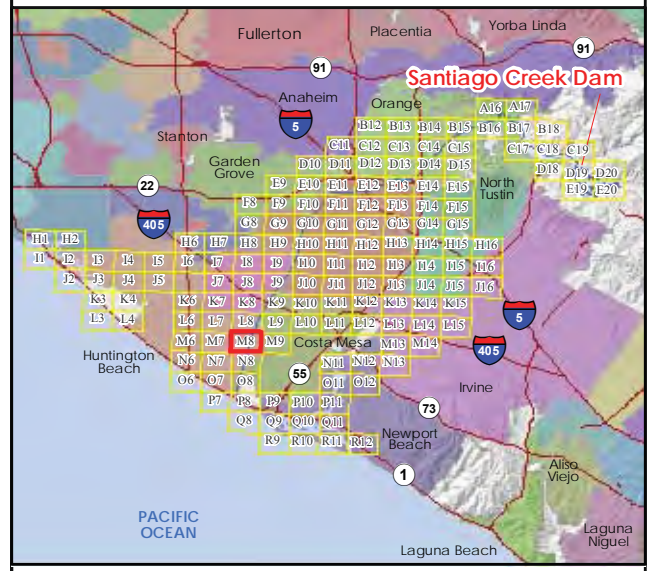
N

**M7**



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School


**Maximum Inundation Depth, Sunny Day Failure**


- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.



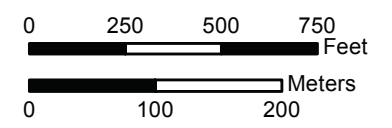
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

  
**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019



PANEL 121 of 148

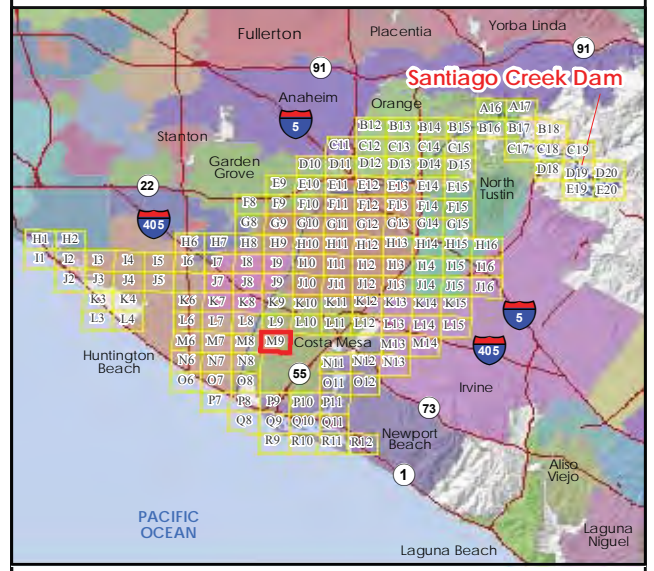
**M8**

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**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 122 of 148

**M9**

0 250 500 750 Feet

0 100 200 Meters

117°56'0"W

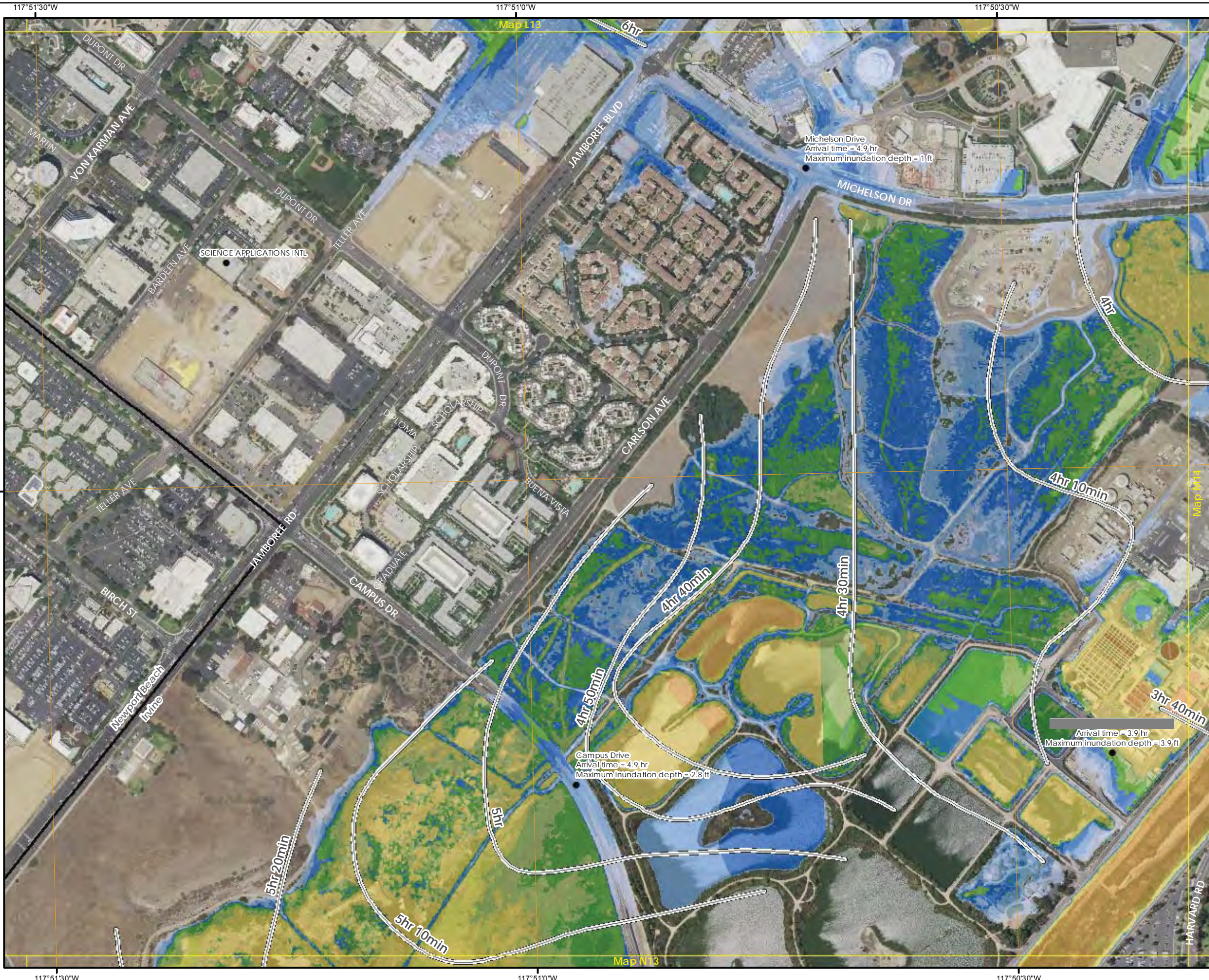
117°55'30"W

117°56'0"W

117°55'30"W

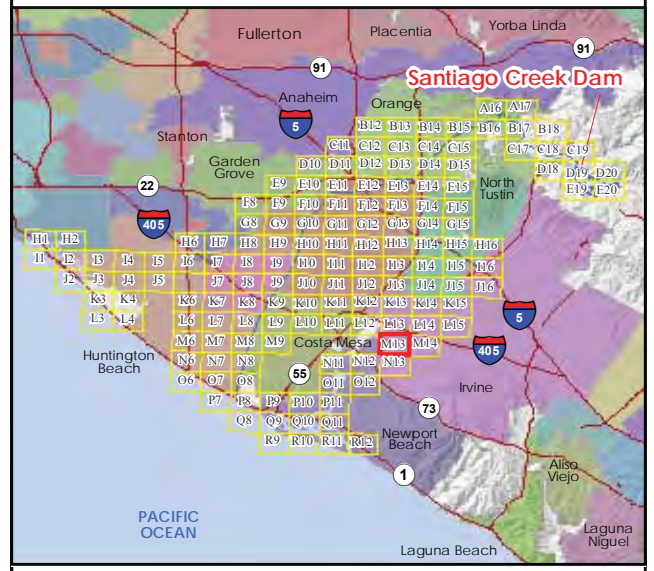
33°40'0"N





# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

Map Panel #	0-1 ft
Dam Crest	1-2 ft
River	2-3 ft
Arrival Time	3-4 ft
City Boundary	4-5 ft
River Mile	5-10 ft
	10-20 ft
	20-30 ft
	30-40 ft
	>40 ft

Maximum Inundation Depth, Sunny Day Failure

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

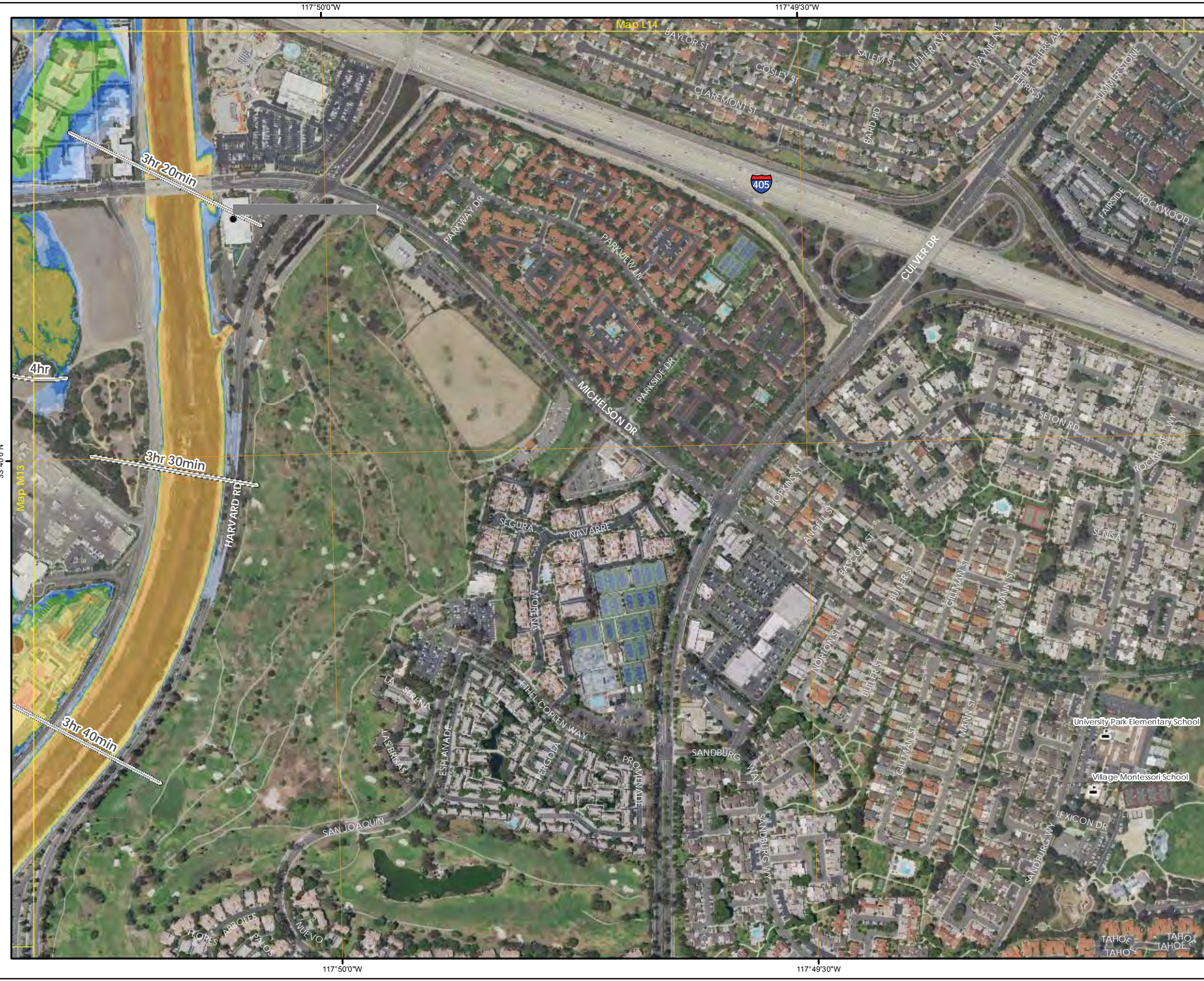
PANEL 123 of 148

**STETSON**  
ENGINEERS INC.

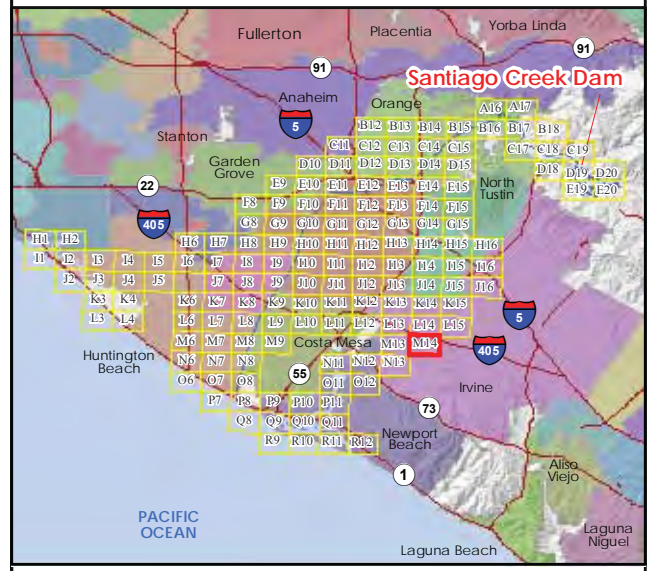
**M13**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

PANEL 124 of 148

N

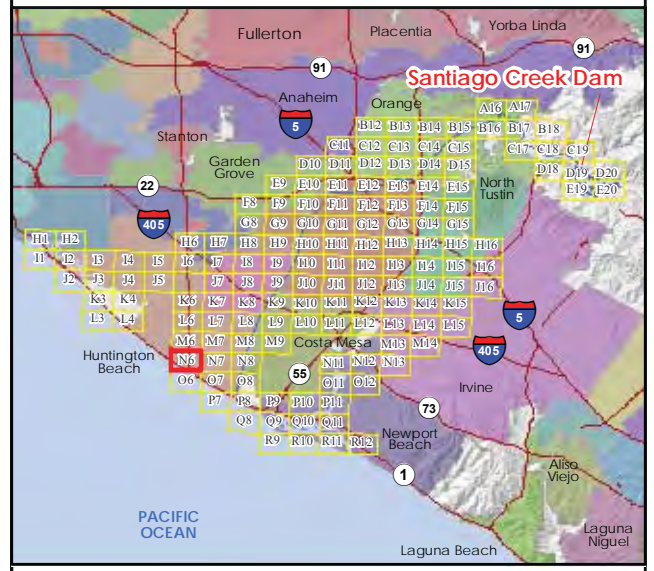
**M14**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- F Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

**PANEL 125 of 148**

N

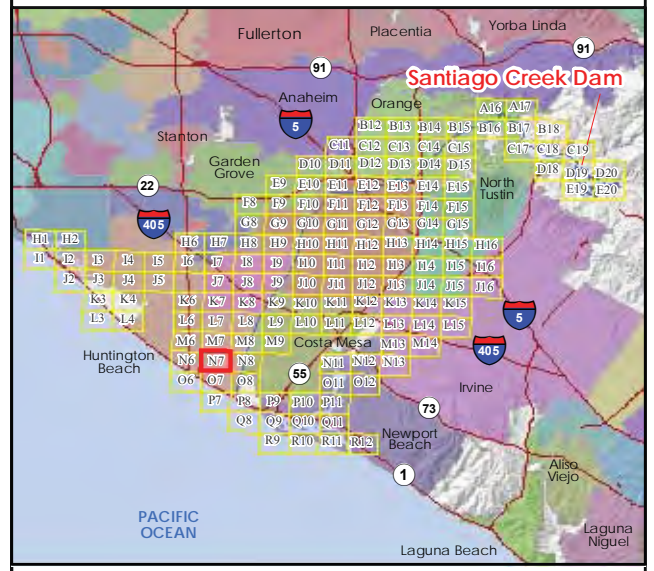
N6



Document Path: J:\m2478\IRWD\_SantiagoDam\_ArrivalTime\_11x17.mxd



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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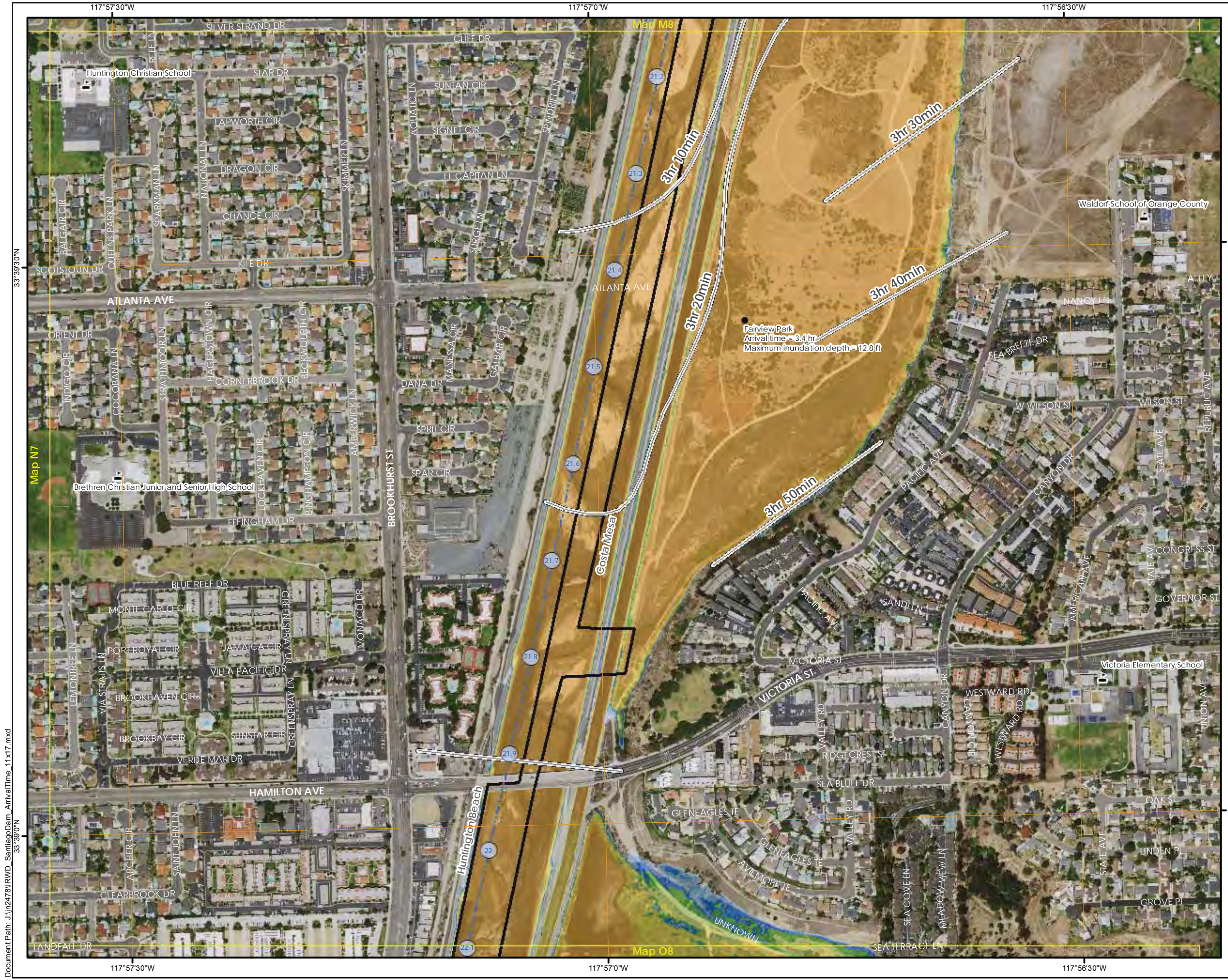
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*

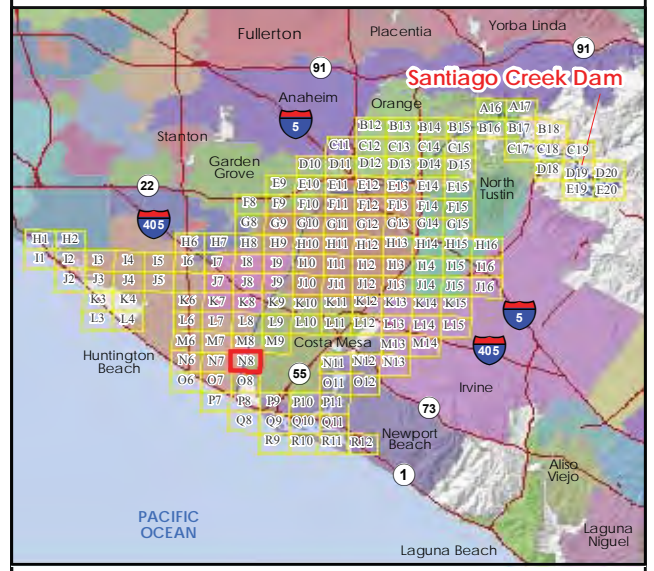
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 126 of 148

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
 Civil Engineer 71788  
 Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

**PANEL 127 of 148**

N

N8

0 250 500 750 Feet

0 100 200 Meters

117°53'30"W

117°53'0"W

33°39'30"N

33°39'30"N

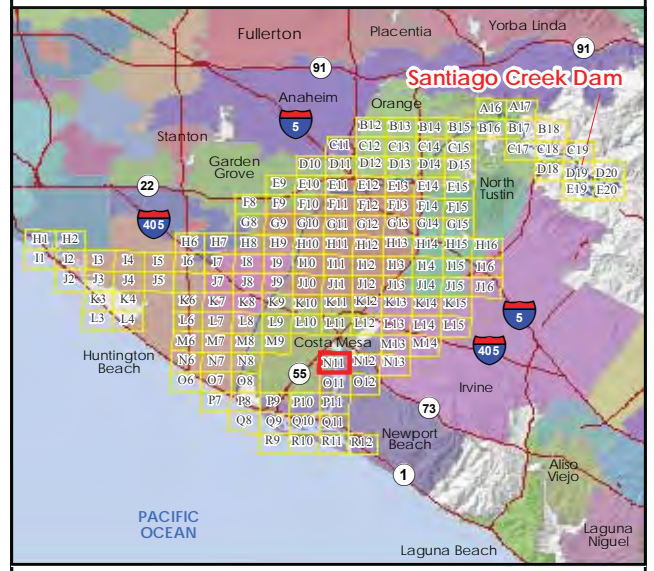
33°39'0"N

117°53'30"W

117°53'0"W



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

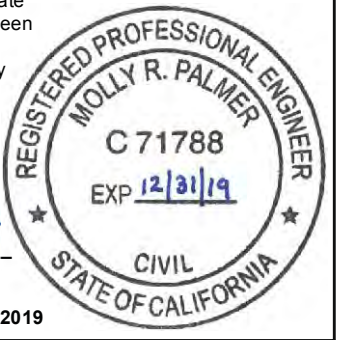
Map Panel #	0-1 ft
Dam Crest	1-2 ft
River	2-3 ft
Arrival Time	3-4 ft
City Boundary	4-5 ft
River Mile	5-10 ft
School	10-20 ft
Fire Station	20-30 ft
	30-40 ft
	>40 ft

1/26/2018

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Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



PANEL 128 of 148

**STETSON ENGINEERS INC.**

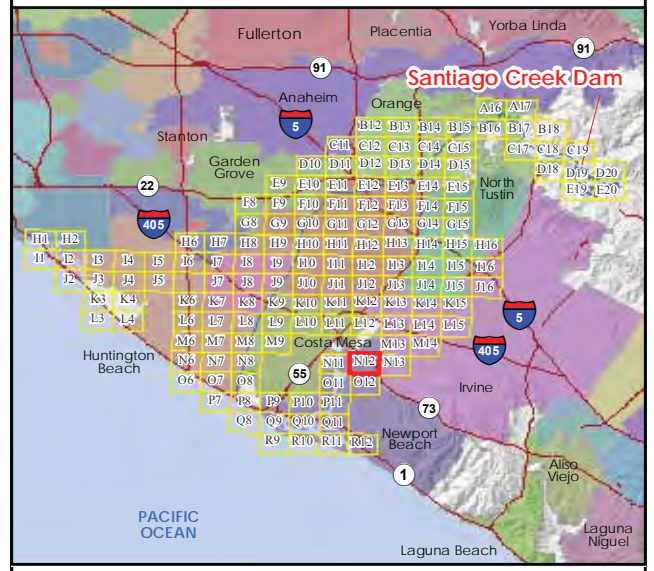
**N11**

0 250 500 750 Feet

0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*  
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

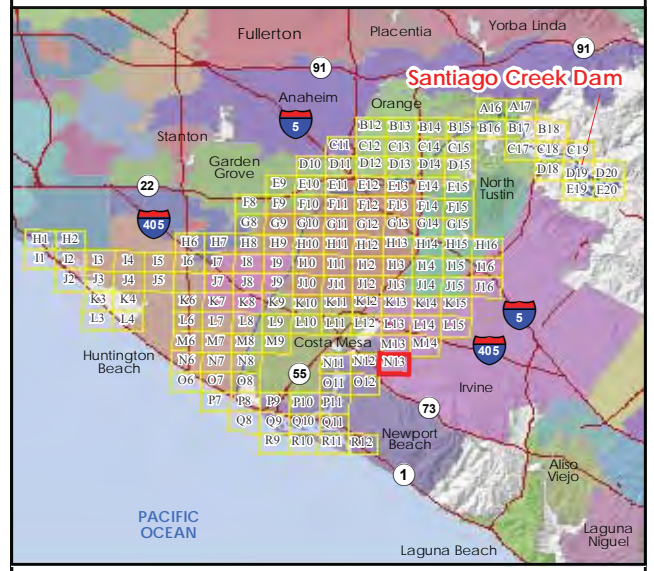
PANEL 129 of 148

**N12**

**STETSON**  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 130 of 148

**N13**

0 250 500 750 Feet

0 100 200 Meters

117°51'30"W

117°51'0"W

117°50'30"W

33°39'30"N

33°39'30"N

33°39'0"N

33°39'0"N

117°51'30"W

117°51'0"W

117°50'30"W

Map N13

Map N12

5hr 20min

5hr 30min

6hr

4hr 30min

4hr 20min

4hr 10min

3hr 50min

4hr

CAMPUS DR

UNIVERSITY DR

ACADEMY

CALIFORNIA AVE

CALIFORNIA AVE

CALIFORNIA AVE

MEDICAL PLAZA DR

INNOVATION

MESA DR

MESA DR

PEREIRA DR

PEREIRA DR

PEREIRA DR

PEREIRA DR

STANFORD RD

STANFORD RD

BRIDGE RD

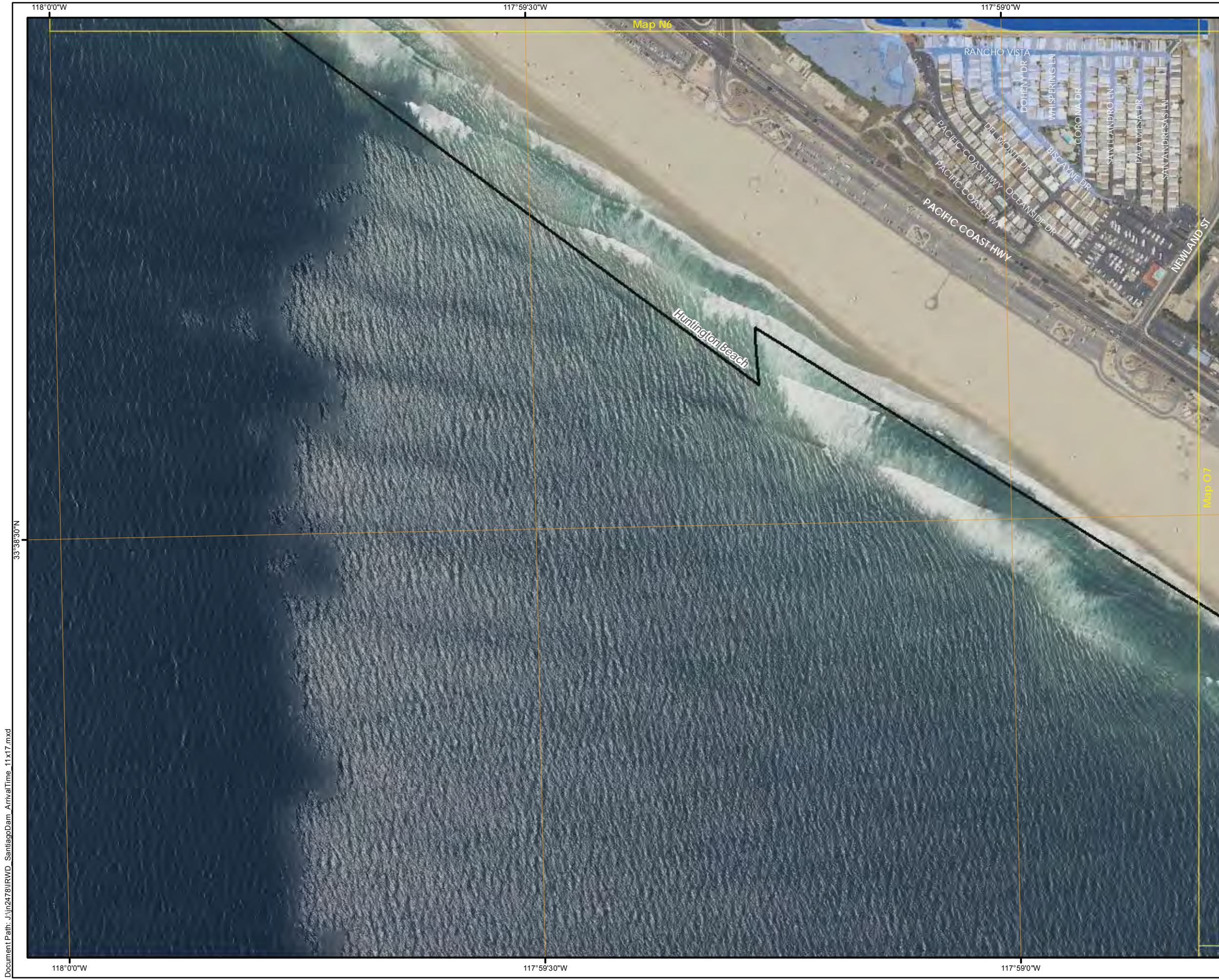
STANFORD RD

University Post Office

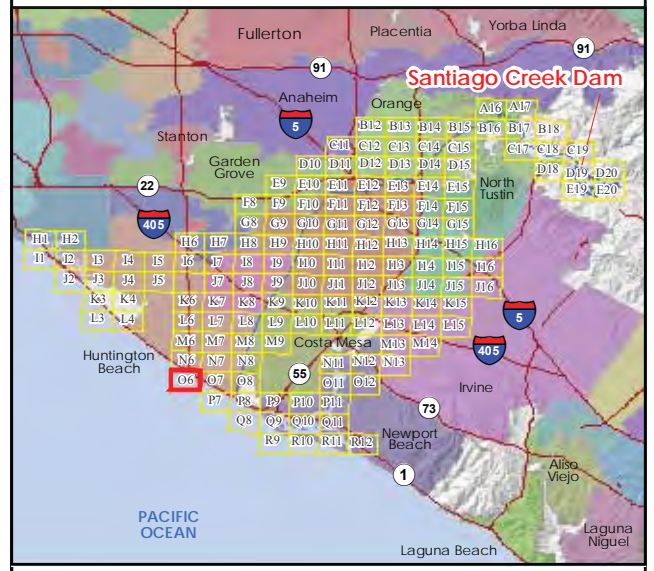
University of California Irvine

FARCHILD RD (JAMBOREE)

HARVARD RD



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 131 of 148

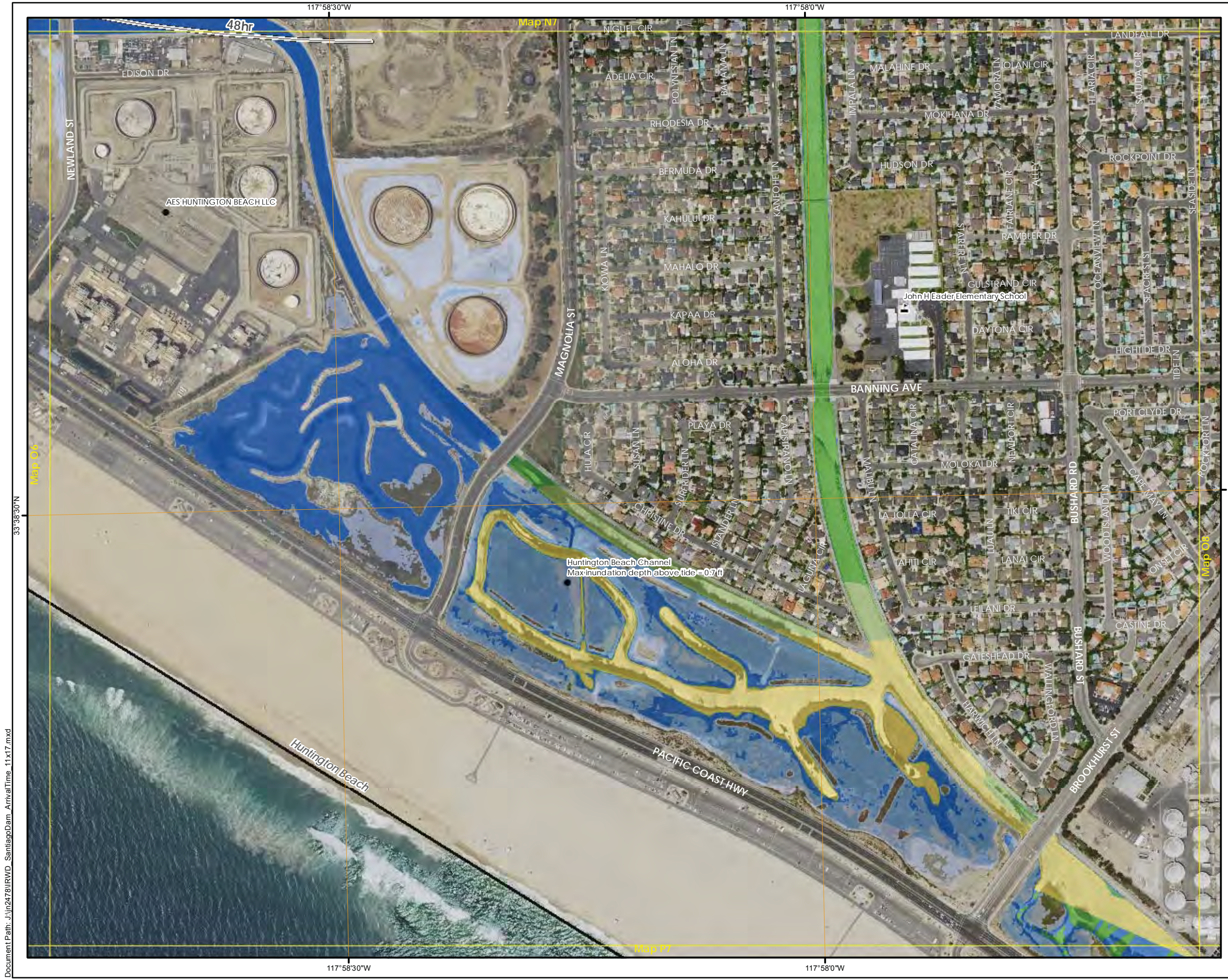
N

**06**

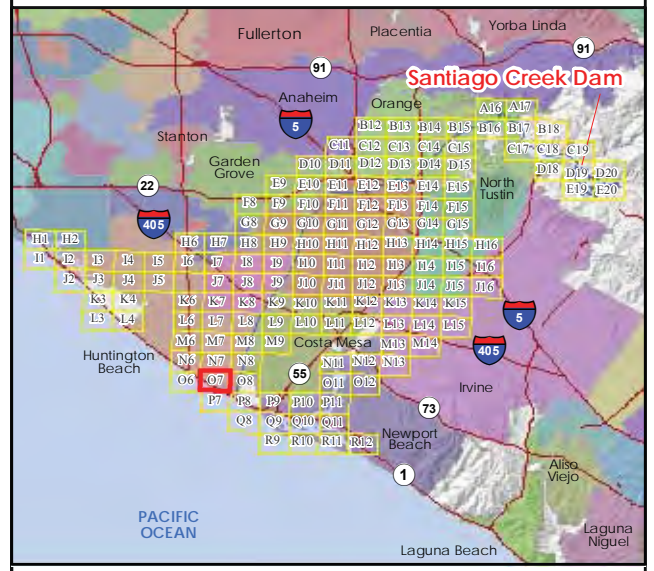
0 250 500 750 Feet

0 100 200 Meters

**STETSON**  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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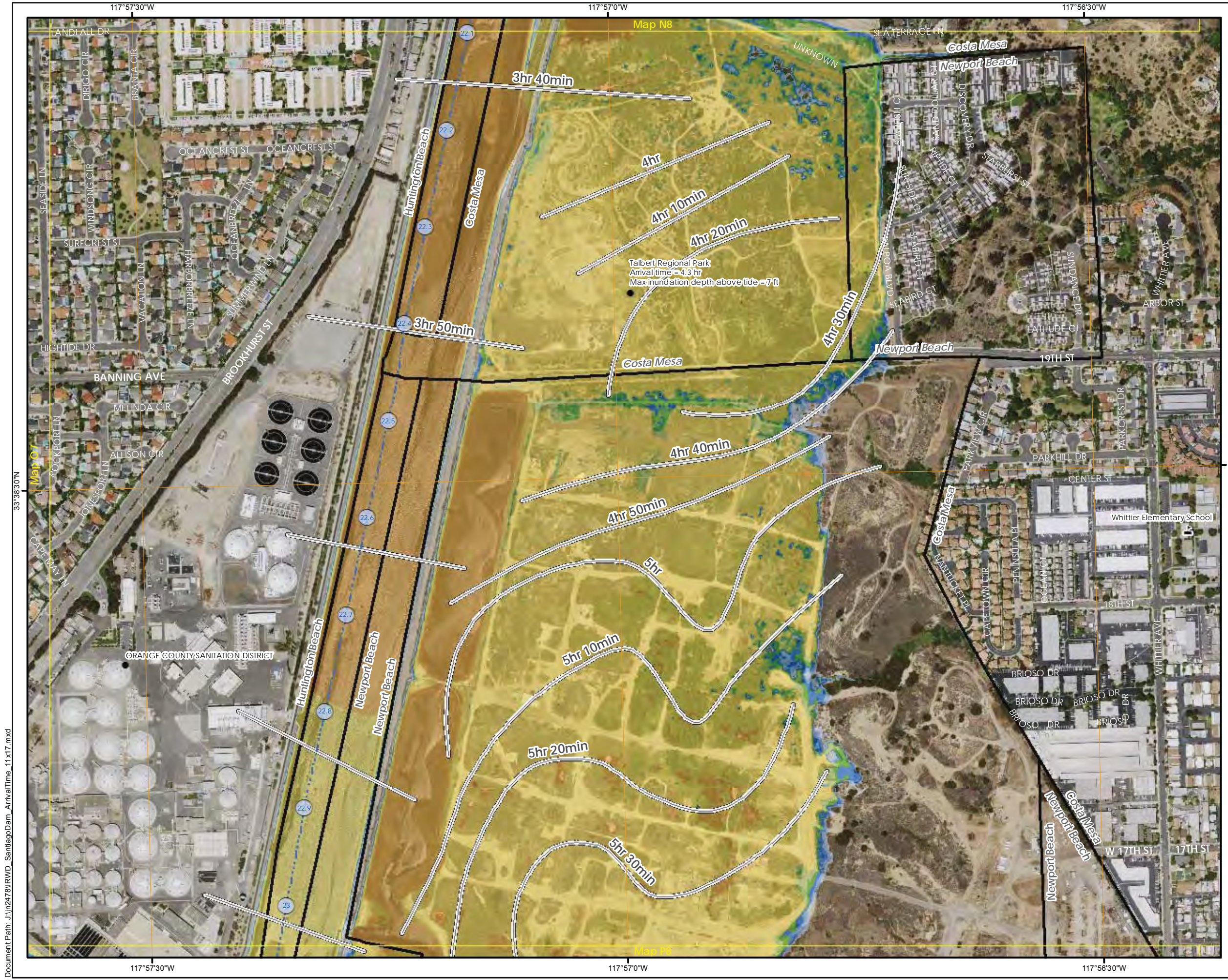
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*Molly Palmer*

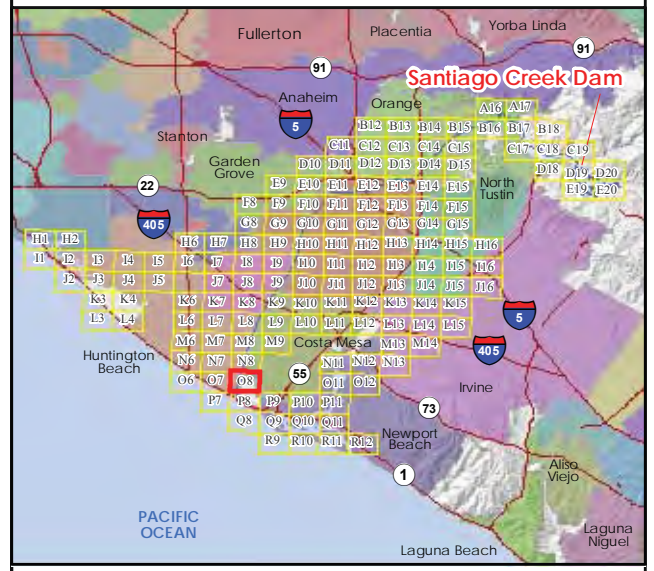
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 132 of 148

**STETSON ENGINEERS INC.**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 133 of 148

**08**

Feet

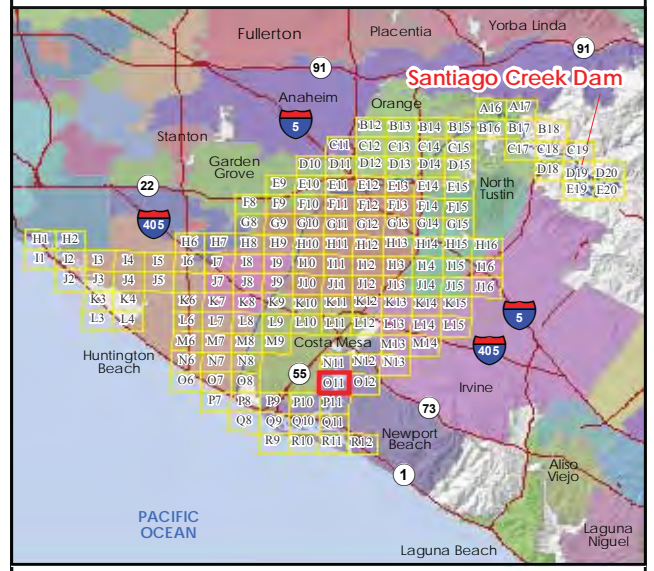
Meters

**STETSON**  
ENGINEERS INC.





**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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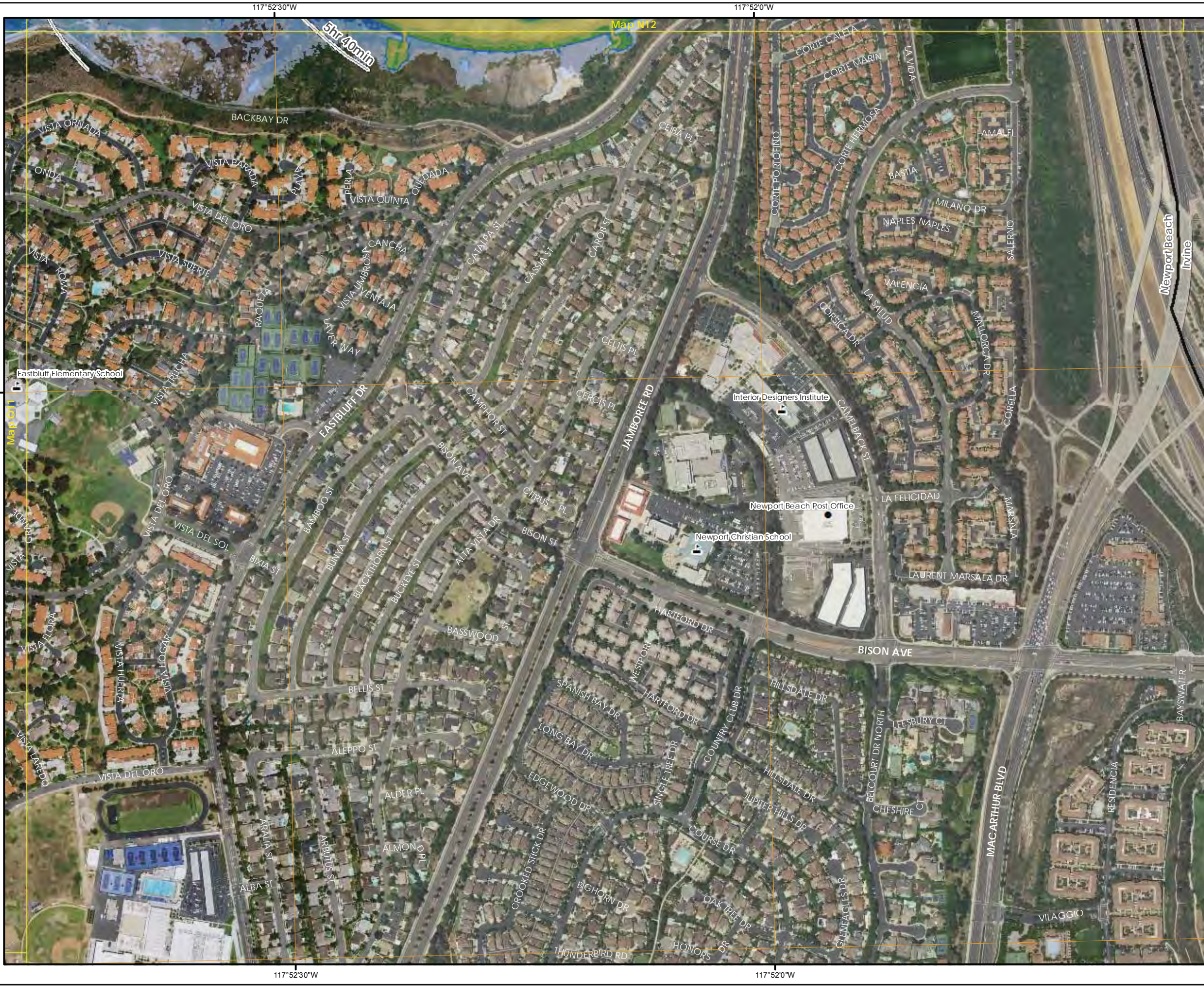
*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

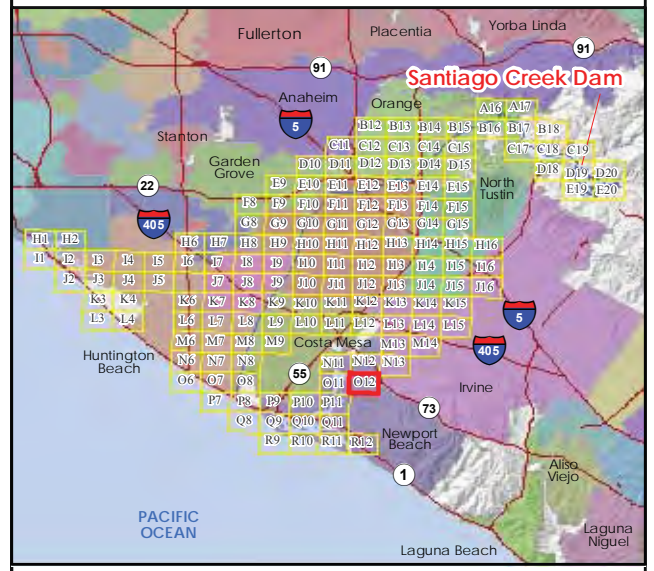
PANEL 134 of 148

**O11**

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**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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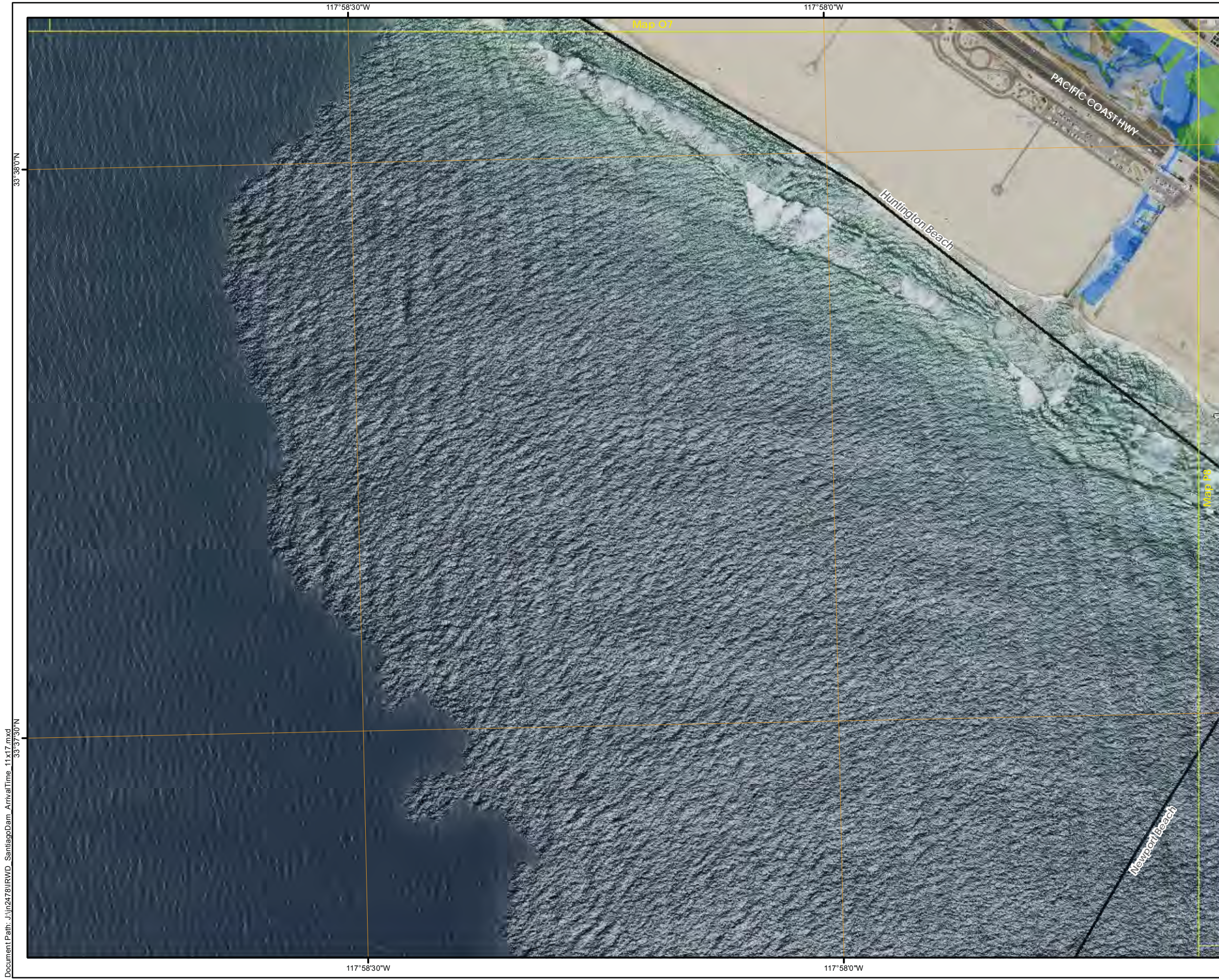
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 135 of 148

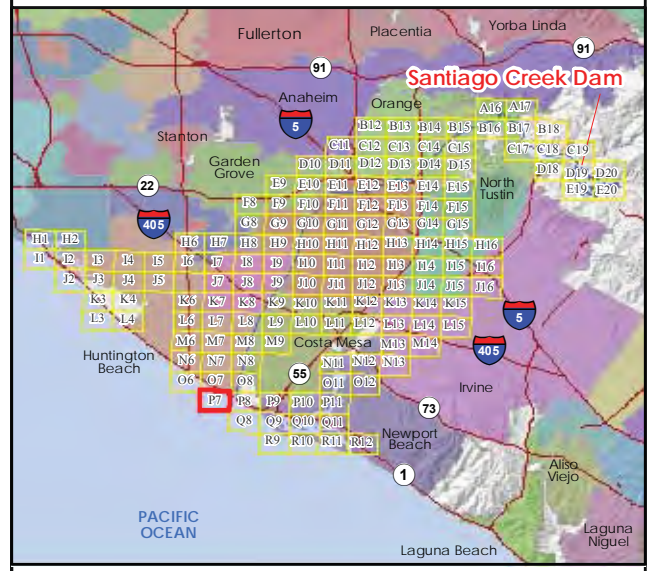
**012**

**STETSON**  
ENGINEERS INC.

N



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



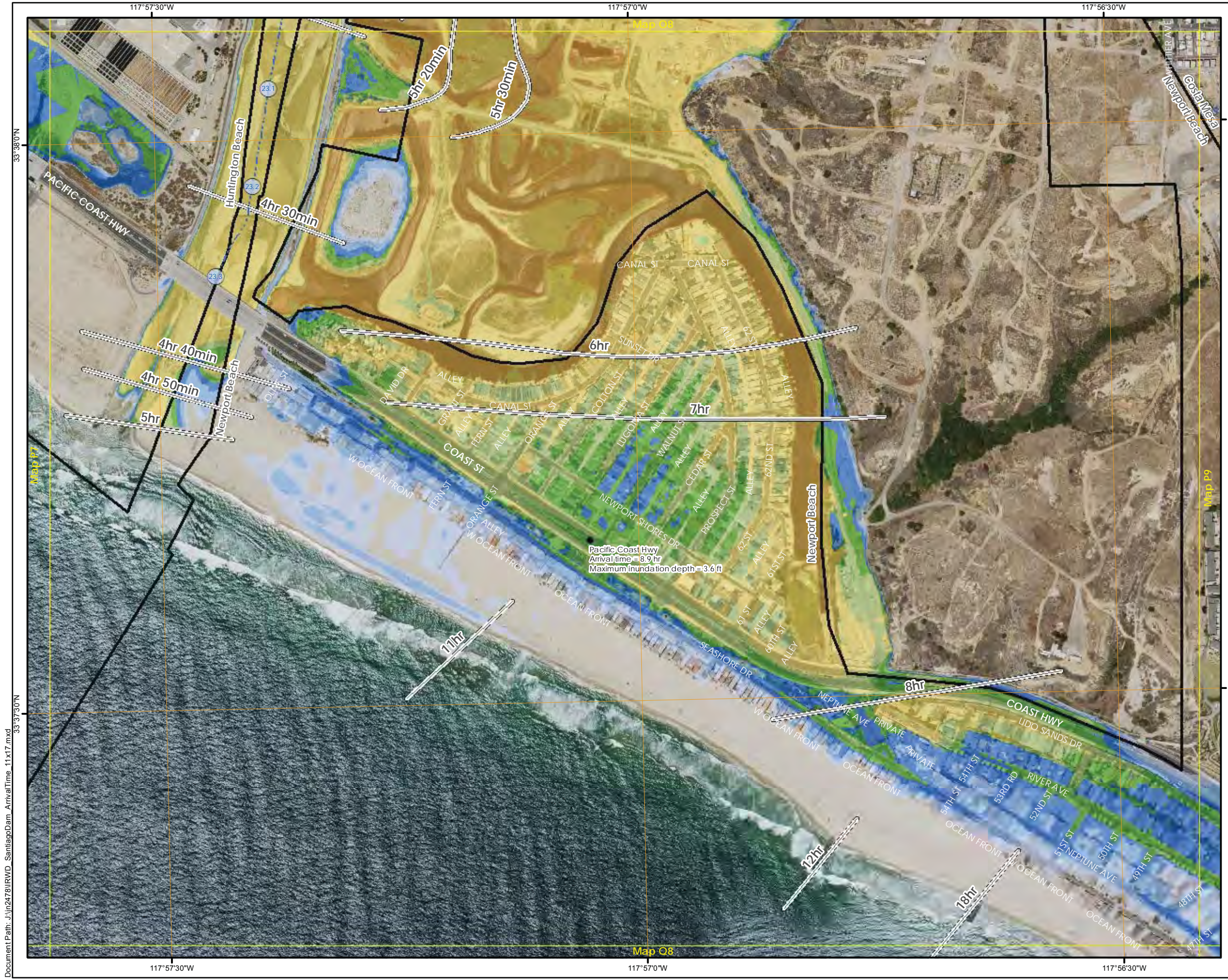
PANEL 136 of 148

**P7**

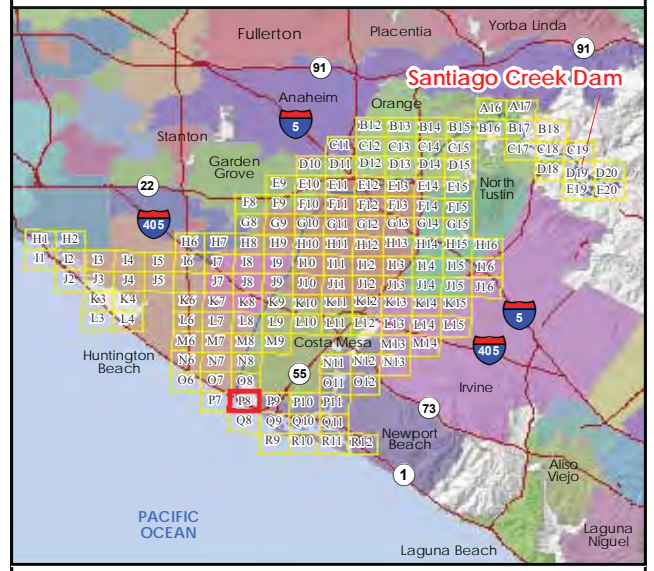
N

Feet

Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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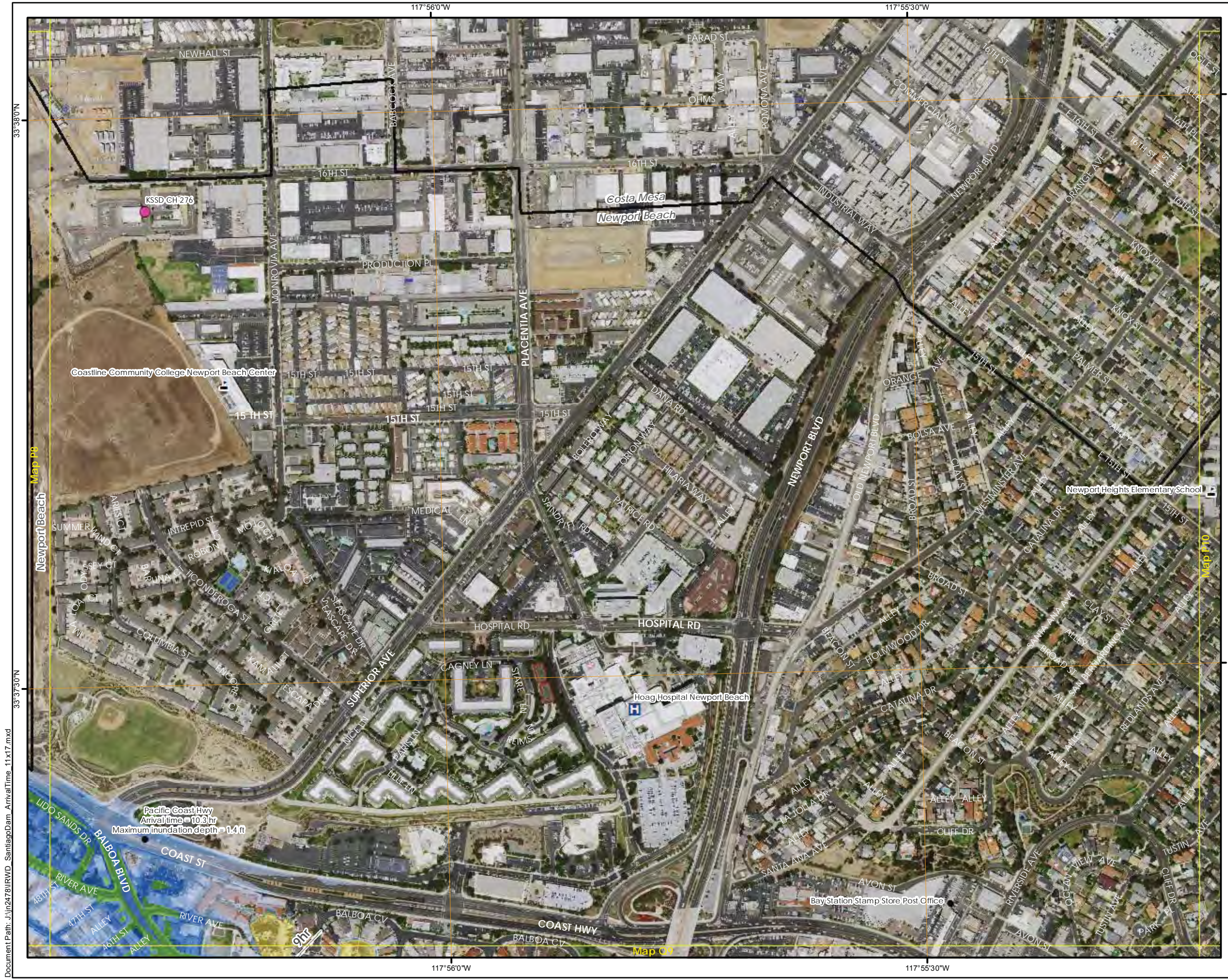
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 137 of 148

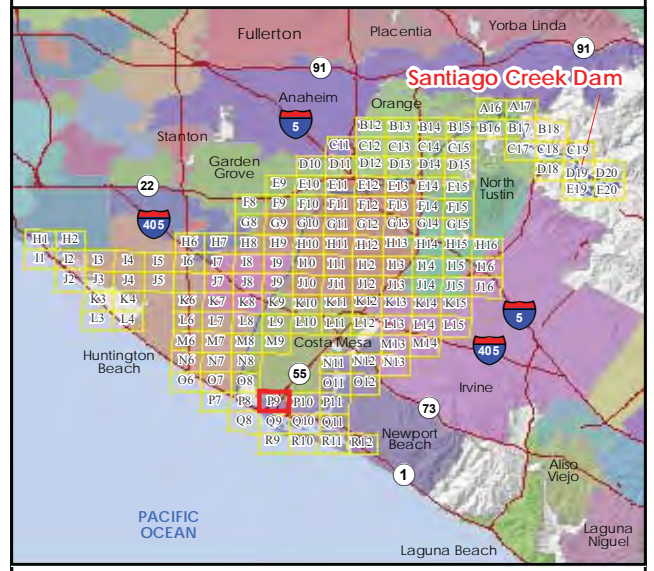
**P8**

N

STETSON  
ENGINEERS INC.



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- ▲ School
- Communications Facility
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

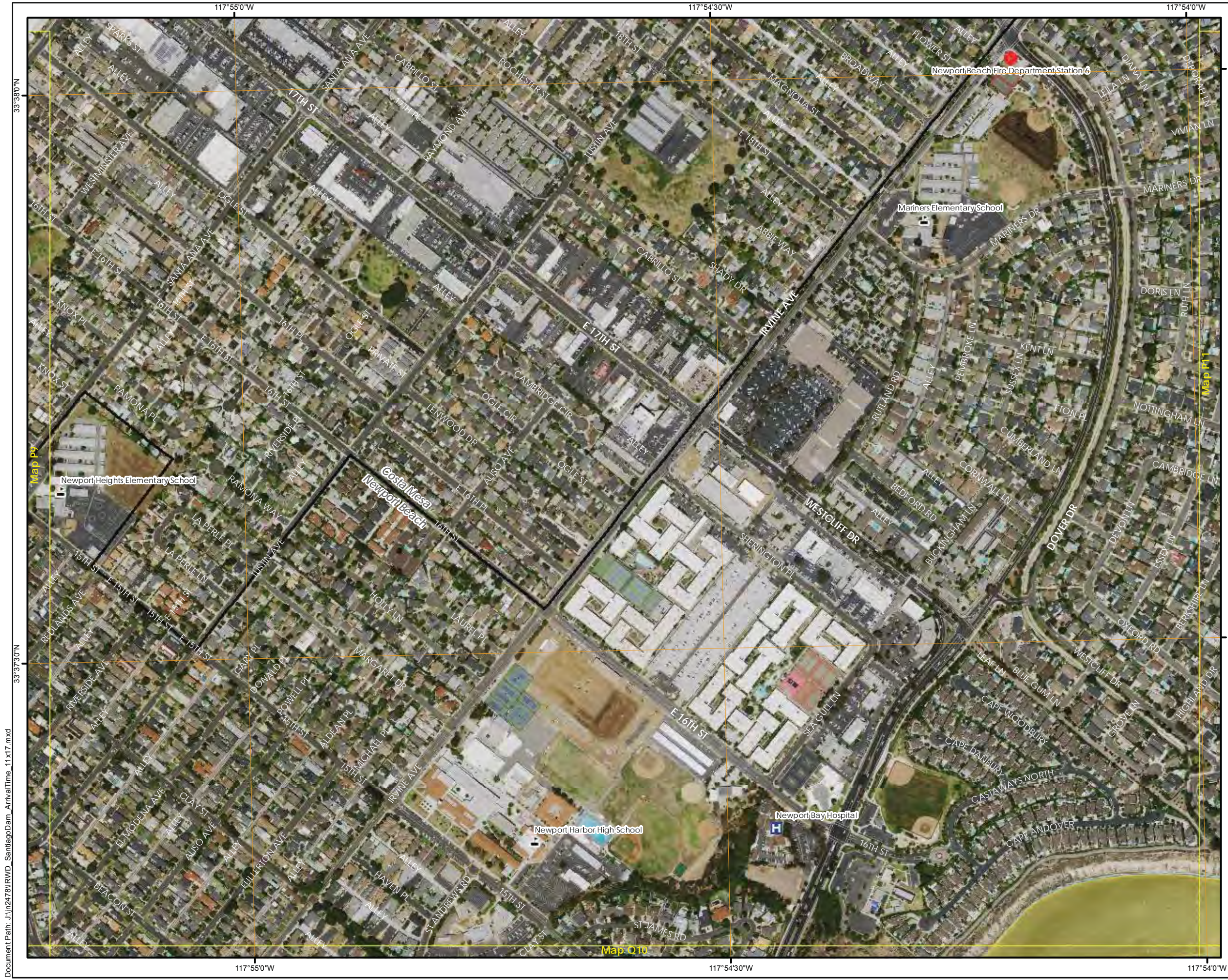
1/26/2018

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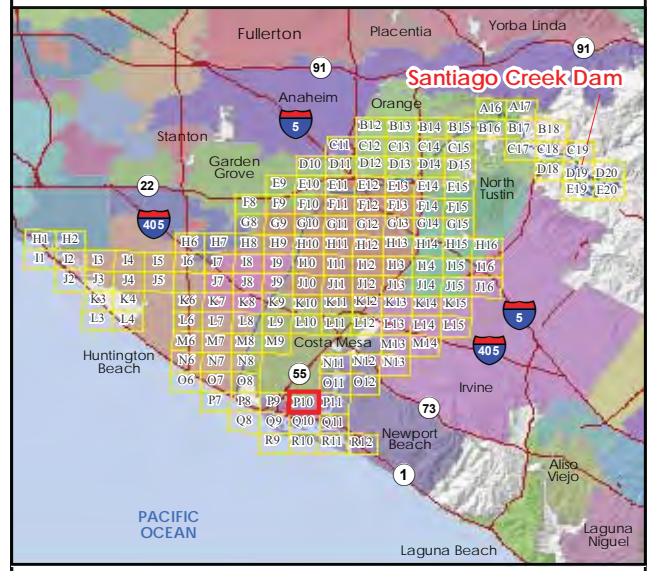
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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 138 of 148** **P9**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station
- Medical Facility

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

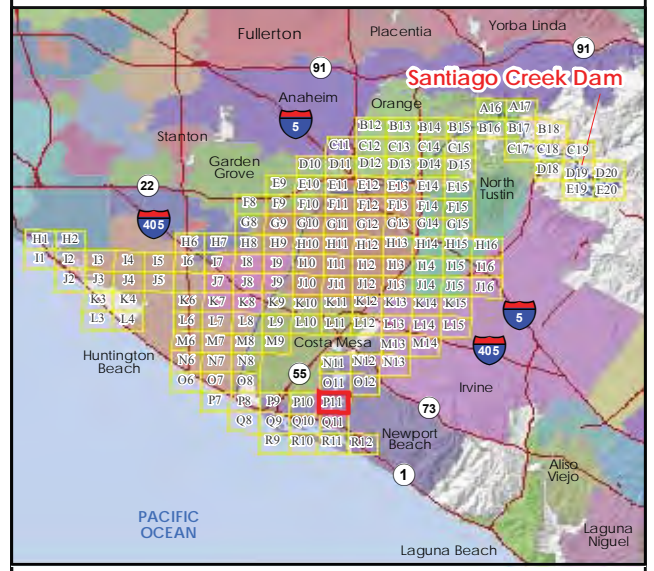
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 139 of 148

**P10**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- F Fire Station
- P Police Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 140 of 148

**P11**

STETSON  
ENGINEERS INC.

117°57'30"W 117°57'0"W 117°56'30"W

Map P8

18hr

SEASHORE DR  
OCEAN FRONT

33°37'0"N

33°37'0"N

Map Q9

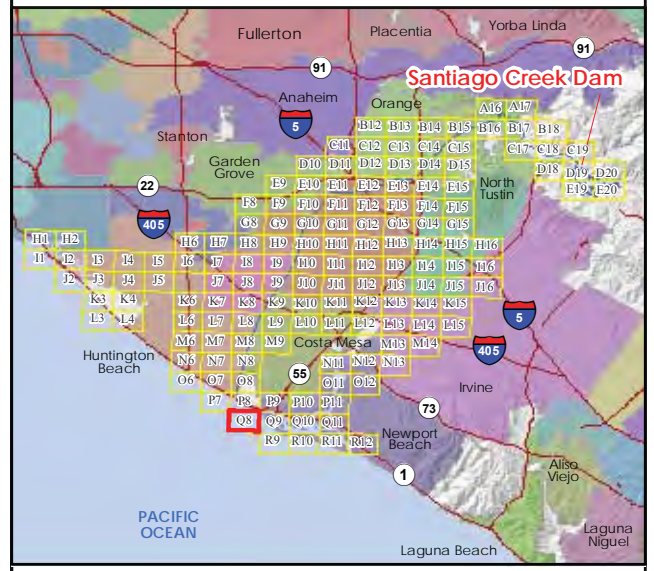
33°36'30"N

33°36'30"N

117°57'30"W 117°57'0"W 117°56'30"W

# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

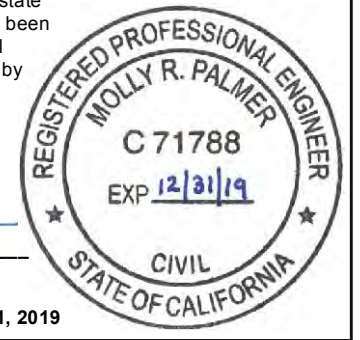
**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

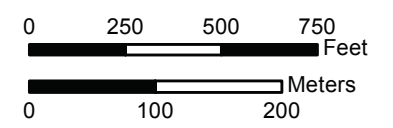


Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 141 of 148



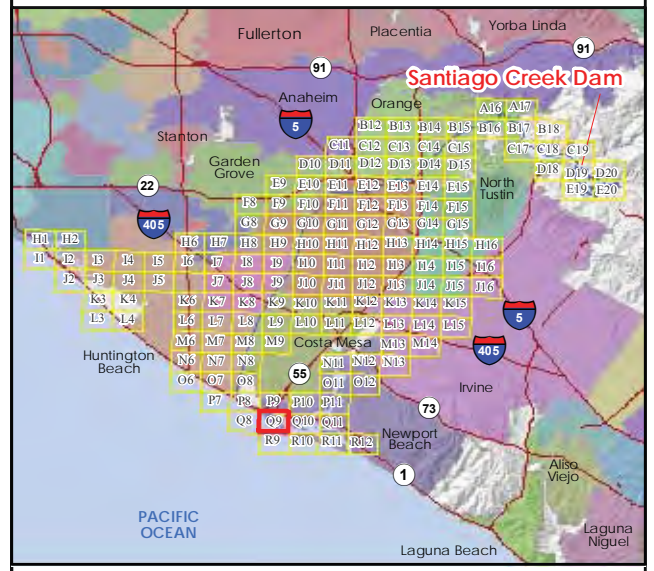
Q8







**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 142 of 148

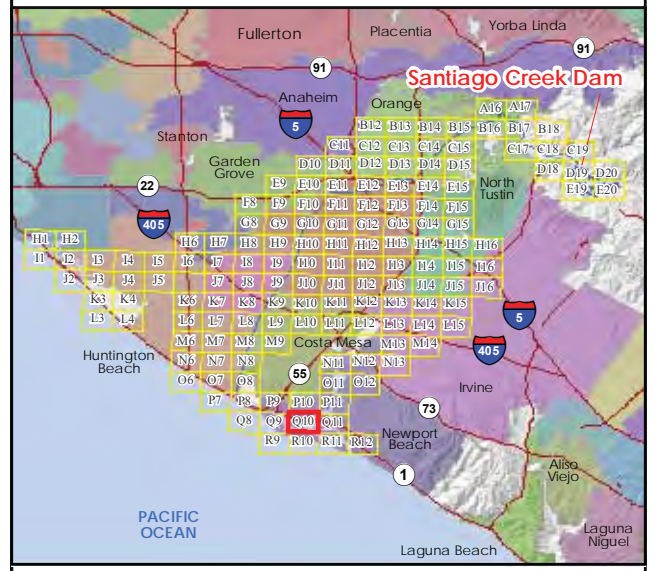
**STETSON  
ENGINEERS INC.**

N  
Q9

0 250 500 750 Feet  
0 100 200 Meters



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

PANEL 143 of 148

N

**Q10**

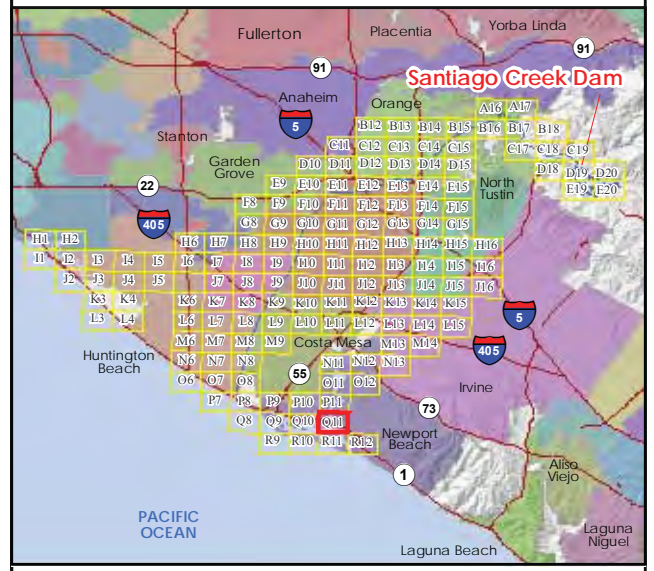
0 250 500 750 Feet

0 100 200 Meters



# SANTIAGO CREEK DAM FLOOD ARRIVAL TIME

STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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*Molly Palmer*

**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

REGISTERED PROFESSIONAL ENGINEER

MOLLY R. PALMER

C 71788

EXP 12/31/19

CIVIL

STATE OF CALIFORNIA

PANEL 144 of 148

N

**Q11**

0 250 500 750 Feet

0 100 200 Meters

117°56'0"W

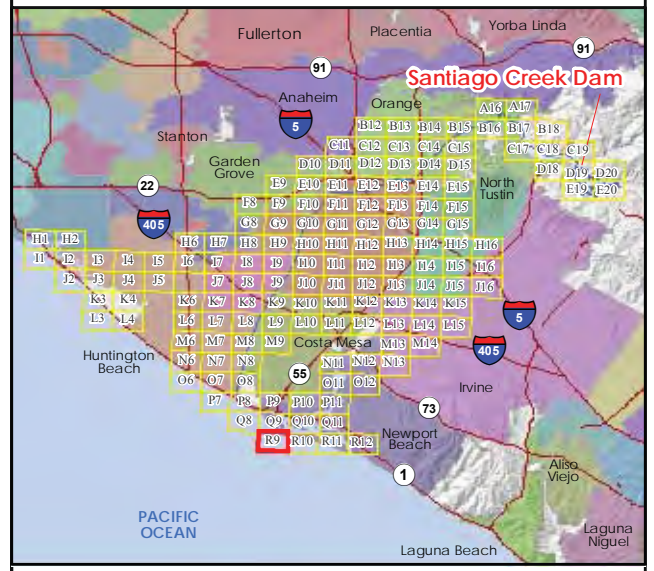
117°55'30"W



117°56'0"W

117°55'30"W

**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

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N

**R9**

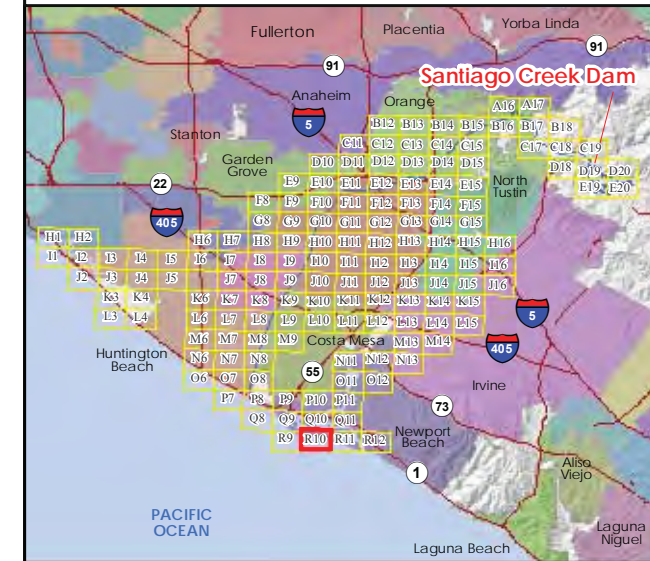
**STETSON ENGINEERS INC.**

117°55'0"W

117°54'30"W



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- |               |          |
|---------------|----------|
| Map Panel #   | 0-1 ft   |
| Dam Crest     | 1-2 ft   |
| River         | 2-3 ft   |
| Arrival Time  | 3-4 ft   |
| City Boundary | 4-5 ft   |
| River Mile    | 5-10 ft  |
| School        | 10-20 ft |
| Fire Station  | 20-30 ft |
|               | 30-40 ft |
|               | >40 ft   |

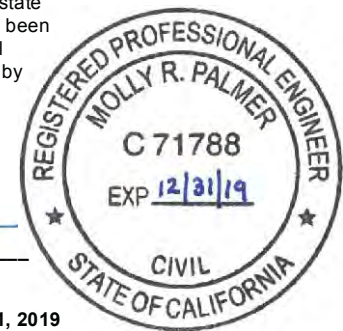
1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*

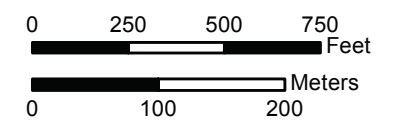
Molly Palmer,  
Civil Engineer 71788  
Expiration Date December 31, 2019



PANEL 146 of 148



R10

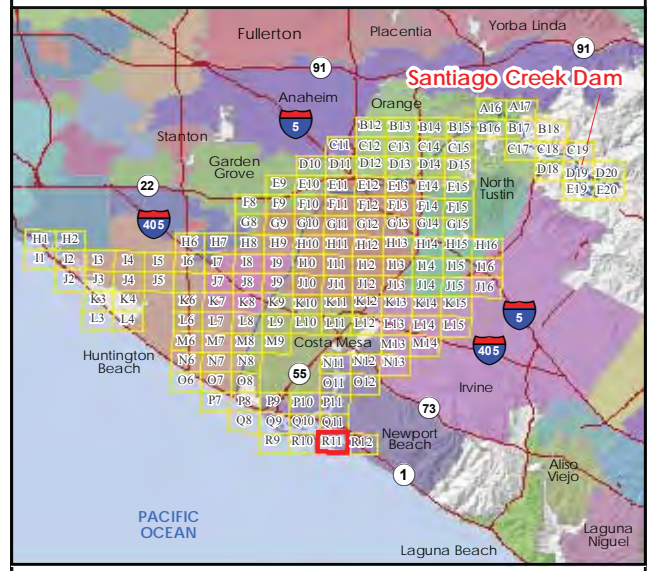


117°55'0"W

117°54'30"W



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- F Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

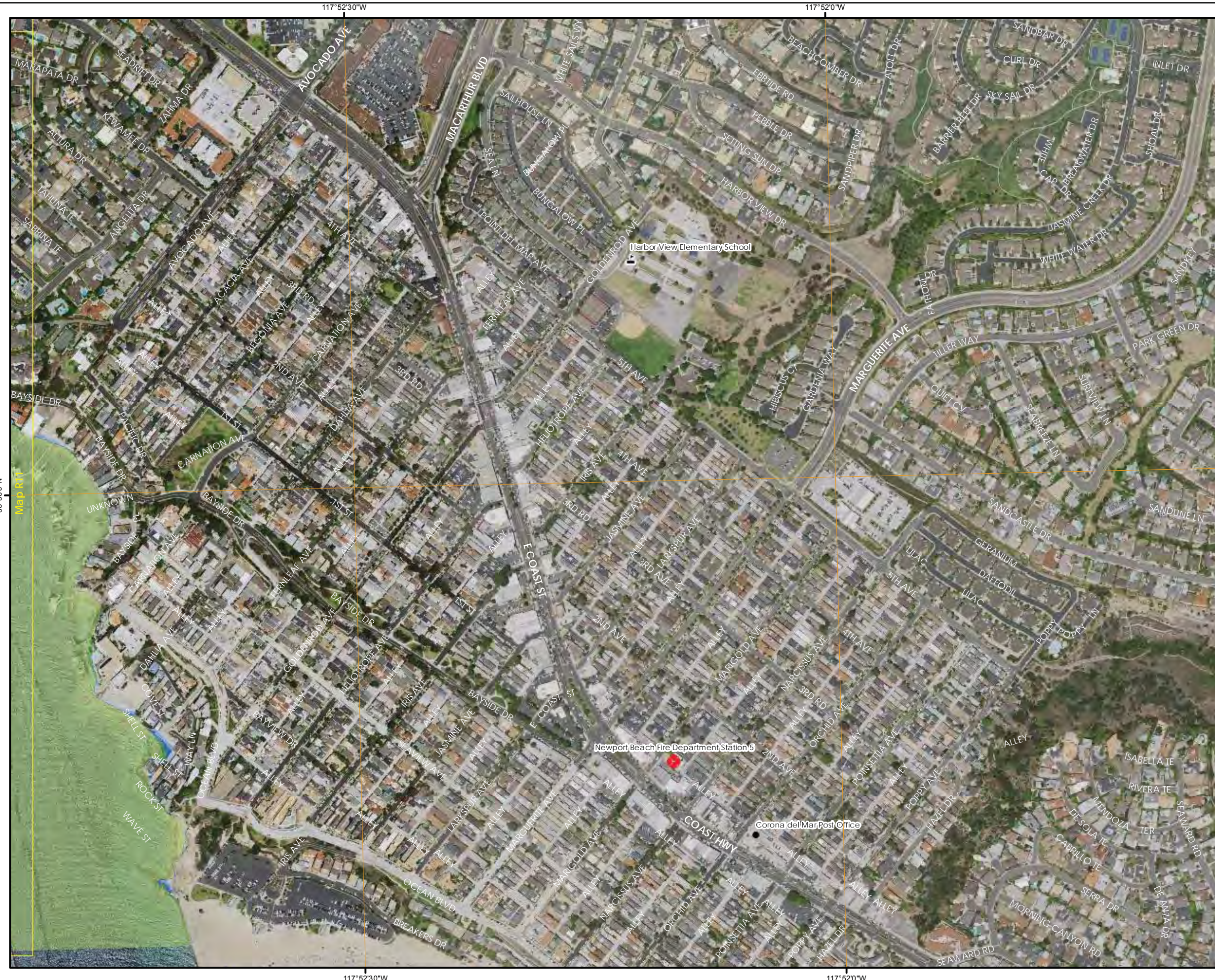
This map meets all applicable state and federal standards and has been prepared in consideration of all potential downstream hazards by a licensed civil engineer.

*Molly Palmer*

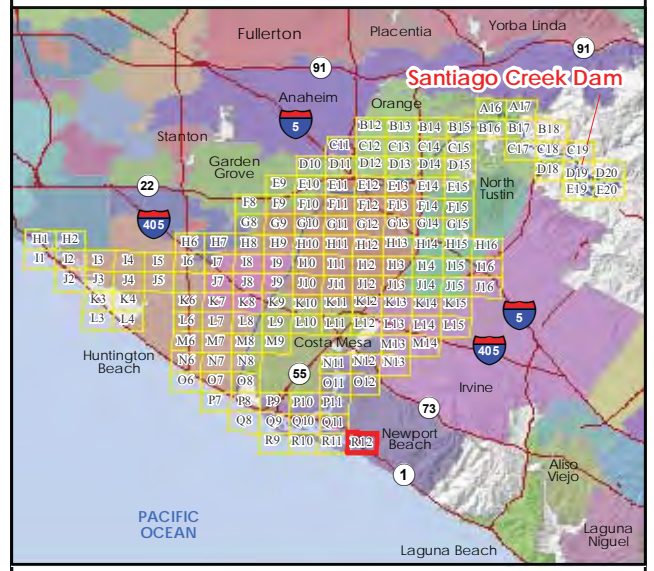
**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

PANEL 147 of 148

**R11**



**SANTIAGO CREEK DAM  
FLOOD ARRIVAL TIME**  
STATE DAM NO. 75.000  
NATIONAL DAM NO. CA00298  
ORANGE COUNTY, CALIFORNIA



**Legend**

- Map Panel #
- Dam Crest
- River
- Arrival Time
- City Boundary
- River Mile
- School
- Fire Station

**Maximum Inundation Depth, Sunny Day Failure**

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-10 ft
- 10-20 ft
- 20-30 ft
- 30-40 ft
- >40 ft

1/26/2018

Note: Grid lines show latitude and longitude at 30 arc-second spacing in the WGS84 horizontal datum. Information shown on this map is approximate and should be used as a guideline for emergency response and preparation purposes.

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**Molly Palmer,**  
Civil Engineer 71788  
Expiration Date December 31, 2019

**PANEL 148 of 148** **R12**

# PART III: Appendices



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# Appendix A: EAP Status Report (for Non-FERC dams)

---

## **EAP Status Report for Santiago Creek Dam, DSOD No. 75.000**

**Annual EAP Review Performed:**

**Annual Update Sent to Plan Holders:**

**Annual Notification Exercise:**

**Prepared by:**

Mail this document, or something similar, to the Cal OES Emergency Action Planning Division:  
Dam Safety Planning Chief  
Dam Emergency Action Planning Division  
3650 Schriever Avenue  
Mather, CA 95655

OR to send it electronically to the Division at [eap@caloes.ca.gov](mailto:eap@caloes.ca.gov).

## Appendix B: Record of EAP Revisions

Revision #	Date	Sections Reviewed or Revisions Made	By Whom
1	4/27/2020	Preliminary Draft for Local Agency Review	IRWD
2	10/14/2020	Updated Draft for Local Agency Review; notification charts updated per discussion with OCSD EMD	IRWD
3	11/25/2020	Updated contact information and notification charts with information received from local agencies	IRWD
4	2/12/2021	Updated EAP in response to CalOES comments in review report No. 1 dated 1/22/2021; updated notification charts to add Caltrans phone number; updated CalOES incident form (Appendix I)	IRWD
5	5/21/2021	Added Transportation Corridor Agencies (Toll Roads) contact info to notification charts and table in section 3.2. Updated IRWD Public Affairs contact info.	IRWD
6	3/7/2022	Annual EAP Update with updated contact information; Sections revised include: Dam contact information; document date; Sections 3.1 (notification charts), 3.2, 6.5, 7.8, 8.2. Appendices B and C. Added dam keeper info to sections 3.1 and 3.2.	IRWD

## Appendix C: Record of Plan Holders

<b>Copy Number</b>	<b>Organization</b>	<b>Person Receiving Copy</b>
1	Cal OES	Dam Safety Planning Division
2	California Highway Patrol, Santa Ana Office	Sgt Jeff Beam, Captain Michael Harris, Lt. Bradley Palmer,
3	Caltrans District 12 Office	Bala Nanjappa
4	Costa Mesa Fire and Rescue	Dan Stefano, Chief
5	Costa Mesa Police Department	Jason Dempsey, Emergency Services Administrator
6	DSOD	Sharon Tapia, Chief of DSOD  Cameron Lancaster, Area 9 Engineer  Richard Draeger, Regional Engineer
7	DWR Flood Operations Center	State-Federal Flood Operations Center
8	Fountain Valley Fire Department	Ron Cookston, Chief
9	Fountain Valley Police Department	Matt Sheppard, Chief
10	Garden Grove Police Department	Tom DeRe, Chief Linda Clark-Morin, EOC Operation Coordinator,
11	Huntington Beach Police and Fire Departments	Brevyn Mettler, Emergency Services Coordinator  Eric Parra, Police Chief
12	Irvine Police Department	Robert Simmons, Emergency Management Administrator
13	Irvine Ranch Water District	John Fabris, IRWD Public Affairs

14	Irvine Ranch Water District	Bill Wesson, Recycled Water Operations Supervisor
15	Irvine Ranch Water District	Steve Choi, Director of Safety and Security; IRWD EAP Coordinator
16	Irvine Ranch Water District	Ken Pfister, IRWD Operations Manager
17	Irvine Ranch Water District	Jacob Moeder, P.E., Engineering Department
18	Irvine Ranch Water District	Wendy Chambers, Executive Director of Operations
19	National Weather Service	Alex Tardy, Warning Coordination Meteorologist, Skywarn Program Manager
20	Newport Beach Fire Department	Jeff Boyles, Fire Chief
21	Newport Beach Police Department	Katie Eing, Emergency Services Coordinator, Jon T. Lewis, Chief
22	Orange County Fire Authority	James Henery, Division 6 Chief
23	Orange County Fire Authority	Baryic Hunter, Division 4 Chief
24	Orange County Fire Authority	Shane Sherwood Division 2 Chief
25	Orange County Fire Authority	Phillip Johnson, Division Chief, ECC/Emergency
26	Orange County Parks	Zachary Salazar, Operations Support Manager
27	Orange County Public Works	Penny Lew, P.E. Sr. Civil Engineer Trevor Richardson
28	Orange County Sheriff's Department	Michelle Anderson, Emergency Management Director,
29	Orange County Sheriff's Department	Brent Benson, Commander-North Operations,
30	Orange County Sheriff's Department	Gary Knutson Lieutenant- North Ops/Villa Park

31	Orange County Sheriff's Department	Derek Gard Supervising Communications Officer
32	Orange County Sheriff's Department, Emergency Management Division	Kevin McArthur, Senior Emergency Management Program Coordinator
33	Orange Fire Department	Sean deMetropolis, Chief
34	Orange Police Department	Dan Adams, Chief
35	Santa Ana Police Department	Steve Rhyner, Emergency Operations Coordinator
36	Seal Beach Police Department	Philip L. Gonshak, Chief
37	Serrano Water District	Jerry Vilander, General Manager Vinnie Coppola, Dam Keeper
38	Transportation Corridor Agencies (Toll Roads)	Lori Olin, Director, Communications
39	Tustin Police Department	Stephen Foster, Emergency Operations Coordinator
40	Villa Park (City of Villa Park)	Steve Franks, City Manager Steve Strapac, City Engineer

# Appendix D: Contact Log

After determining the emergency level, use the contact log to document notifications made in accordance with Section 3 of the EAP.

## CONTACT LOG

<b>Dam Name: SANTIAGO CREEK DAM</b>		<b>Date:</b>	
<b>NID #: CA00298</b>	<b>DSOD Dam #:75.000</b>	<b>FERC #: N/A</b>	
<b>DSOD Region: SOUTH</b>		<b>County: ORANGE</b>	
<b>Emergency Level:</b>		<b>Incident/Exercise:</b>	
After determining the emergency level, immediately contact the following agencies/entities. The person making the contact should initial and record the time of the call and who was contacted at each agency/entity.			
<b>Agency/Entity</b>	<b>Person Contacted</b>	<b>Contact Time</b>	<b>Contacted By</b>

# Appendix E: Pre-Scripted Messages

---

The following pre-scripted messages are for use during notifications at any Emergency Level applicable to Santiago Creek Dam.

## High Flow Emergency Level Notification Script

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County.

We have activated the Emergency Action Plan for this dam and are determining this to be a **High Flow** condition. The Santiago Creek Dam is not in danger of failing. Again, this is a **High Flow** condition and the Santiago Creek Dam is not in danger of failing.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that flows into the reservoir  
(time) (date)  
are unusually high.

Current flow into the reservoir is \_\_\_\_ cfs.

Current flow out of the reservoir is \_\_\_\_ cfs.

Current water surface elevation in the reservoir is \_\_\_\_ feet.

The dam is not predicted to fail as a result of this condition. We will provide updates detailing any changes in flow or dam condition, and will notify you when the high flow situation is resolved.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

---

### Non-Failure Emergency Level

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Non-Failure** condition. Again, this is a **Non-Failure** condition.

At \_\_\_\_\_ on \_\_\_\_\_, IRWD observed or verified that:  
(time) (date)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

We are implementing predetermined actions to investigate and respond to this condition.

The dam is not predicted to fail as a result of this condition.

We will advise you when the situation is resolved or if the situation gets worse.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.



---

## Potential Failure Emergency Level

This is \_\_\_\_\_ [your name and position].

We have an emergency condition at Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County.

We have activated the Emergency Action Plan for this dam and are determining this to be a **Potential Failure** condition.

We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure.

Please reference the inundation maps and prepare to evacuate the low-lying portions of south Orange, Santa Ana, Tustin, Fountain Valley, and north Costa Mesa. In the event of a failure, portions of I-5, I-405, CA-22, CA-55, and CA-57 are expected to be inundated along with many surface streets throughout the area.

The dam could potentially fail as early as\_\_\_\_\_.

Reference the inundation map in your copy of the Emergency Action Plan.

We will advise you when the situation is resolved or if the situation gets worse.

I can be contacted at the following number: \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

---

### **Imminent Failure Emergency Level**

This is an emergency. This is \_\_\_\_\_ [your name and position].

Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County, is failing.

The downstream area must be evacuated immediately.

Repeat, Santiago Creek Dam is failing; evacuate the low-lying portions of south Orange, Santa Ana, Tustin, Fountain Valley, and north Costa Mesa. Portions of I-5, I-405, CA-22, CA-55, and CA-57 are expected to be inundated along with many surface streets throughout the area.

We have activated the Emergency Action Plan for this dam and are determining this to be an Imminent Failure condition.

Reference the inundation map in your copy of the Emergency Action Plan.

I can be contacted at the following number \_\_\_\_\_.

If you cannot reach me, please call the following alternative number: \_\_\_\_\_.

The next status report will be provided in approximately 30 minutes.

---

## Public Message

The following pre-scripted message may be **used for emergency management authorities to communicate the Imminent Failure of the dam with the public:**

Attention: This is an emergency message from \_\_\_\_\_ [emergency management agency]. Listen carefully. Your life may depend on immediate action.

Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County, is failing.  
Repeat. Santiago Creek Dam No. 75.000, located at Irvine Lake in Orange County, is failing.

If you are in or near this area, proceed immediately to high ground. The low-lying portions of south Orange, Santa Ana, Tustin, Fountain Valley, and north Costa Mesa may be flooded. Portions of I-5, I-405, CA-22, CA-55, and CA-57 are expected to be inundated along with many surface streets throughout the area, and access may be limited. High flows are expected in Santiago Creek, Santa Ana River, San Diego Creek, and Upper Newport Bay. Do not approach channels where high flow is expected.

If you are in or near this area, proceed immediately to high ground away from low lying areas.

Repeat message.

# Appendix F: Emergency Incident Log

Name:		Job Title:	
Incident Start Date:		Incident Start Time:	
Incident Description:			
Initial Incident Level:			
Incident Detection:			
When did you detect or learn about the incident?			
How did you detect or learn about the incident?			
LOG ALL NOTIFICATION AND ACTIVITY IN THE TABLE BELOW			
Date	Time	Action/Incident Progression	Action Taken By

# Appendix G: Emergency Termination Log

Dam Name: SANTIAGO CREEK DAM	County: ORANGE
Dam Location: 33.7863, -117.7252	Stream/River: SANTIAGO CREEK
Date/Time:	
Weather Conditions:	
General Description of Emergency Situation:	
Area(s) of Dam Affected:	
Extent of Damage to Dam and Possible Causes:	
Effect on Dam Operation:	
Initial Reservoir Elevation/Time:	
Maximum Reservoir Elevation/Time:	
Final Reservoir Elevation/Time:	
Description of Area Flooded Downstream/Damage/Loss of Life:	
Justification for Termination of Dam Safety Emergency:	
Other Data and Comments:	
Report Prepared By (Printed Name and Signature):	
Date:	

---

# Appendix H: After Action Report

---

## **Background**

### **Event Details**

Type of Event:

Location:

Incident Period:

Brief Description of Event:

## **Response Activities**

## **Summary of Successes**

## **Summary of Recommended Improvements**

## **Organizations Contributing to this Report**

# Appendix I: Cal OES Warning Center Dam Incident Report

## DAM INCIDENT – CALIFORNIA STATE WARNING CENTER

<b>EVENT TYPE:</b>	<input type="radio"/> DRILL		<input type="radio"/> ACTUAL EVENT	
<b>DATE:</b>			<b>TIME:</b>	
<b>CALLER INFORMATION</b>				
<b>NAME/AGENCY:</b>		<b>PHONE #:</b>		
<b>ALTERNATE CONTACT:</b>		<b>PHONE #:</b>		
<b>DAM INFORMATION</b>				
<b>DAM NAME:</b> Santiago Creek Dam		<b>DSOD DAM #:</b> 75.000		<b>FERC:</b> none
<b>DSOD HAZARD CLASSIFICATION:</b> EXTREMELY HIGH				
<b>LOCATION OF DAM</b>				
<b>DSOD REGION:</b> <input type="radio"/> NORTHERN <input type="radio"/> CENTRAL <input checked="" type="radio"/> SOUTHERN				
<b>PHYSICAL ADDRESS:</b> 5305 E Santiago Canyon Road, Orange, CA 92869				
<b>LATITUDE:</b> : 33.7863		<b>LONGITUDE:</b> -117.7252		
<b>COUNTY:</b> ORANGE		<b>DOWNSTREAM JURISDICTIONS:</b> County of Orange (un-incorporated areas), City of Orange, City of Villa Park, City of Garden Grove, City of Santa Ana, City of Tustin, City of Westminster, City of Fountain Valley, City of Costa Mesa, City of Huntington Beach, City of Irvine, City of Newport Beach, City of Seal Beach		
<b>NEAREST CITY OR POPULATED AREA:</b> Unincorporated Orange County, City of Orange				
<b>NEAREST OR AFFECTED HIGHWAY OR CROSS ROADS:</b> 241 near Santiago Canyon Rd				
<b>RIVER OR CREEK THAT FLOWS INTO RESERVOIR:</b> Santiago Creek				
<b>SITUATION</b>				
<b>ACTIVATION OF EAP:</b>		<input type="radio"/> Yes <input type="radio"/> No		
<b>EMERGENCY LEVEL:</b>		<input type="radio"/> High Flow <input type="radio"/> Non-Failure <input type="radio"/> Potential Failure <input type="radio"/> Imminent Failure		
<b>EMERGENCY TYPE:</b>				
<input type="checkbox"/> Earthquake		<input type="checkbox"/> Sand Boils		
<input type="checkbox"/> Embankment Cracking or Settlement		<input type="checkbox"/> Security Threats		
<input type="checkbox"/> Embankment Movement		<input type="checkbox"/> Seepage, Springs, Piping		
<input type="checkbox"/> Erosion of Spillway		<input type="checkbox"/> Sinkholes		
<input type="checkbox"/> Instrumentation Reading (Abnormal)		<input type="checkbox"/> Storm Event		
<input type="checkbox"/> Outlet System Failure		<input type="checkbox"/> Other: List Below		
<input type="checkbox"/> Sabotage/Vandalism				
<b>OTHER:</b>				
<b>RESERVOIR LEVEL:</b>		<input type="checkbox"/> Full <input type="checkbox"/> Partially Full <input type="checkbox"/> Empty		
		<b>Approximate % Full (Acre-Feet):</b>		
<b>WHEN/HOW EVENT WAS DETECTED:</b>				
<b>OBSERVER IN POSITION:</b>		<input type="radio"/> Yes <input type="radio"/> No		
<b>ADDITIONAL DETAILS:</b>				

## Appendix J: Acronym List

---

CAS	Critical Appurtenant Structure
Cal OES	California Governor’s Office of Emergency Services
Caltrans	California Department of Transportation
CHP	California Highway Patrol
cfs	cubic feet per second
DSOD	Division of Safety of Dams
DWR	Department of Water Resources
EAP	Emergency Action Plan
EMD	Orange County Sheriff’s Department, Emergency Management Division
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
HSEEP	Homeland Security Exercise and Evaluation Program
I-5	Interstate 5
I-405	Interstate 405
IC	Incident Commander
ICP	Incident Command Post
IRWD	Irvine Ranch Water District
MWRP	Michelson Water Recycling Plant
NAVD88	North American Vertical Datum of 1988
NID	National Inventory of Dams
NIMS	National Incident Management System
NWS	National Weather Service
OA	Operational Area
OAC	Operational Area Coordinator
OCFA	Orange County Fire Authority
OCPW	Orange County Public Works
OCSD	Orange County Sheriff’s Department



PIM ..... Public Information Manager  
PSAP ..... Public Safety Answering Point  
SCADA.....supervisory control and data acquisition  
SEMS .....Standardized Emergency Management System  
SWD..... Serrano Water District