Eastern Research Group, Inc.

WRAP POINT AND AREA SOURCE EMISSIONS PROJECTIONS FOR THE 2018 BASE CASE INVENTORY, VERSION 1

Prepared for:

Western Governors' Association and
The Western Regional Air Partnership,
Stationary Sources Joint Forum

Prepared by:

Eastern Research Group, Inc.
8950 Cal Center Drive
Suite 348
Sacramento, California 95826

January 25, 2006

3484.00.002.003

WRAP POINT AND AREA SOURCE EMISSIONS PROJECTIONS FOR THE 2018 BASE CASE INVENTORY, VERSION 1

Prepared for:

Western Governors' Association (WGA) and the
Western Regional Air Partnership (WRAP),
Stationary Sources Joint Forum (SSJF)
Denver, Colorado

Prepared by:

Eastern Research Group, Inc.
8950 Cal Center Drive
Suite 348
Sacramento, California 95826

January 25, 2006

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS – CONT.

TABLE OF CONTENTS – CONT.

Figures **Page**

ACRONYMS

ARB	California Air Resources Board
BACM	best available control measures
Btu	British thermal unit
CAA	Clean Air Act
CAMD	Clean Air Markets Division
CAP	criteria air pollutant
CD	consent decree
CEFS	California Emission Forecasting System
CEIDARS	California Emission Inventory Development and Reporting System
CEM	continuous emissions monitor
CENRAP	Central Regional Air Planning Association
CF	capacity factor
CO	carbon monoxide
CT	capacity threshold
EAC	Early Action Compact
EDMS	Emissions Data Management System
EGAS	Economic Growth and Analysis System
EGU	electricity generating unit
EIA	Energy Information Administration
EIC	emission inventory code
ER	emission rate
ERG	Eastern Research Group

FCCU	fluidized catalytic cracking unit
GF	growth factor
HI	heat input
IAS	Integrated Assessment System
IDA	Inventory Data Analyzer
lbs	pounds
MACT	maximum achievable control technology
MDF	medium density fiberboard
MMBtu	million British thermal units
MMscf	million standard cubic feet
MW	megawatts
MWh	megawatt-hours
NAR	Native American Reservation
NEAP	Natural Events Action Plan
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NH_3	ammonia
NIF	National Emissions Inventory Format
NO_x	nitrogen oxides
NSCR	non-selective catalytic reduction
NSPS	New Source Performance Standards
NSR	New Source Review
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter

PSD	Prevention of Significant Deterioration
RCO	regenerative catalytic oxidation
RHR	Regional Haze Rule
RICE	reciprocating internal combustion engines
RMC	Regional Modeling Center
ROG	reactive organic gases
RTO	regenerative thermal oxidation
SCE	Southern California Edison
scf	standard cubic foot
SCR	selective catalytic reduction
SIP	State Implementation Plan
SMOKE	Sparse Matrix Operator Kernel Emissions
SO_2	sulfur dioxide
SRP	Salt River Project
SSJF	Stationary Sources Joint Forum
TEP	Tucson Electric Power
TPY	tons per year
U.S. EPA	U.S. Environmental Protection Agency
VOC	volatile organic compounds
WGA	Western Governors' Association
WRAP	Western Regional Air Partnership
µm	micrometer

PREFACE

Regulatory Framework for Tribal Visibility Implementation Plans

The Regional Haze Rule explicitly recognized the authority of tribes to implement the provisions of the Rule, in accordance with principles of Federal Indian law, and as provided by the Clean Air Act §301(d) and the Tribal Authority Rule (TAR) (40 CFR §§49.1-.11). Those provisions create the following framework:

1. Absent special circumstances, reservation lands are not subject to state jurisdiction.

2. Federally recognized tribes may apply for and receive delegation of federal authority to implement CAA programs, including visibility regulation, or "reasonably severable" elements of each programs (40 CFR §§49.3, 49.7). The mechanism for this delegation is a Tribal Implementation Plan (TIP). A reasonable severable element is one that is not integrally related to program elements that are not included in the plan submittal, and is consistent with applicable statutory and regulatory requirements.

3. The Regional Haze Rule expressly provides that tribal visibility programs are "not dependent on the strategies selected by the state or states in which the tribe is located" (64 Fed. Reg. 35756), and that the authority to implement §309 TIPs extends to all tribes within the GCVTC region (40 CFR §51.309(d)(12).

4. The U.S. EPA has indicated that under the TAR tribes are not required to submit §309 TIPs by the end of 2003; rather they may choose to opt-in to §309 programs at a later date (67 Fed. Reg. 30439).

5. Where a tribe does not seek delegation through a TIP, U.S. EPA, as necessary and appropriate, will promulgate a Federal Implementation Plan (FIP) within reasonable timeframes to protect air quality in Indian country (40 CFR §49.11). EPA is committed to consulting with tribes on a government to government basis in developing tribe-specific or generally applicable TIPs where necessary (See, e.g. 63 Fed. Reg. 7263-64).

It is our hope that the findings and recommendations of this report will prove useful to tribes, whether they choose to submit full or partial 308 or 309 TIPs, or work with U.S. EPA to develop FIPs. The amount of modification necessary will vary considerably from tribe to tribe. The authors have striven to ensure that all references to tribes in the document are consistent with principles of tribal sovereignty and autonomy as reflected in the above framework. Any inconsistency with this framework is strictly inadvertent and not an attempt to impose requirements on tribes which are not present under existing law.

1.0 INTRODUCTION

The Western Regional Air Partnership (WRAP) is assessing impacts and evaluating control strategies pertaining to regional haze within its geographic domain (States of Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming, and the Native American Reservations located within these states). The WRAP's Stationary Sources Joint Forum (SSJF) sponsored a project to provide WRAP work groups and forums with data, information, and assessments necessary for developing regional haze control strategies. This project was conducted by Eastern Research Group, Inc. (ERG) and its subcontractors, ENVIRON International Corporation and Alpine Geophysics, LLC, for the WRAP SSJF under Contract No. 30204-101 with the Western Governors' Association (WGA). This work was conducted as part of a multi-task effort for the WRAP SSJF, which included the following tasks:

- Task 1A: WRAP 2002 point and area (non-oil and gas) sources emissions inventory quality assurance;
- Task 1B: WRAP 2002 and 2018 oil and gas (area sources) emissions inventory;
- Task 1C: WRAP 2018 base case point and area sources (non-oil and gas) emissions inventory;
- Task 2: Control technology analysis;
- Task 3: Tribal inventories for 2002 and 2018;
- Task 4: California inventories for 2002 and 2018; and
- Temporal profiles for WRAP electric generating units.

This report contains details pertaining to the data and methods used, and results achieved for Task 1C (2018 base case) and Task 4 (California inventories for 2018). Also, in order to provide a comprehensive set of emissions inventory summaries in this report, the results from Tasks 1A, 1B, and 3 are incorporated.

The specific objectives of the 2018 base case inventory task were as follows:

- Develop and implement a transparent methodology that would be understood and transferred to the WRAP SSJF; member tribal, state, and local agencies; and stakeholders;

- Use information collected from the tribal, state, and local agencies, and stakeholders to the greatest extent possible;
- Provide a technically sound basis for development of control strategies to be used in regional haze analyses;
- Establish a format that facilitates conversion of results into various formats including U.S. EPA's National Emissions Inventory Format (NIF) Version 3.0 and Inventory Data Analyzer (IDA) format for use with the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system; and
- Provide a comprehensive set of growth and control factors.

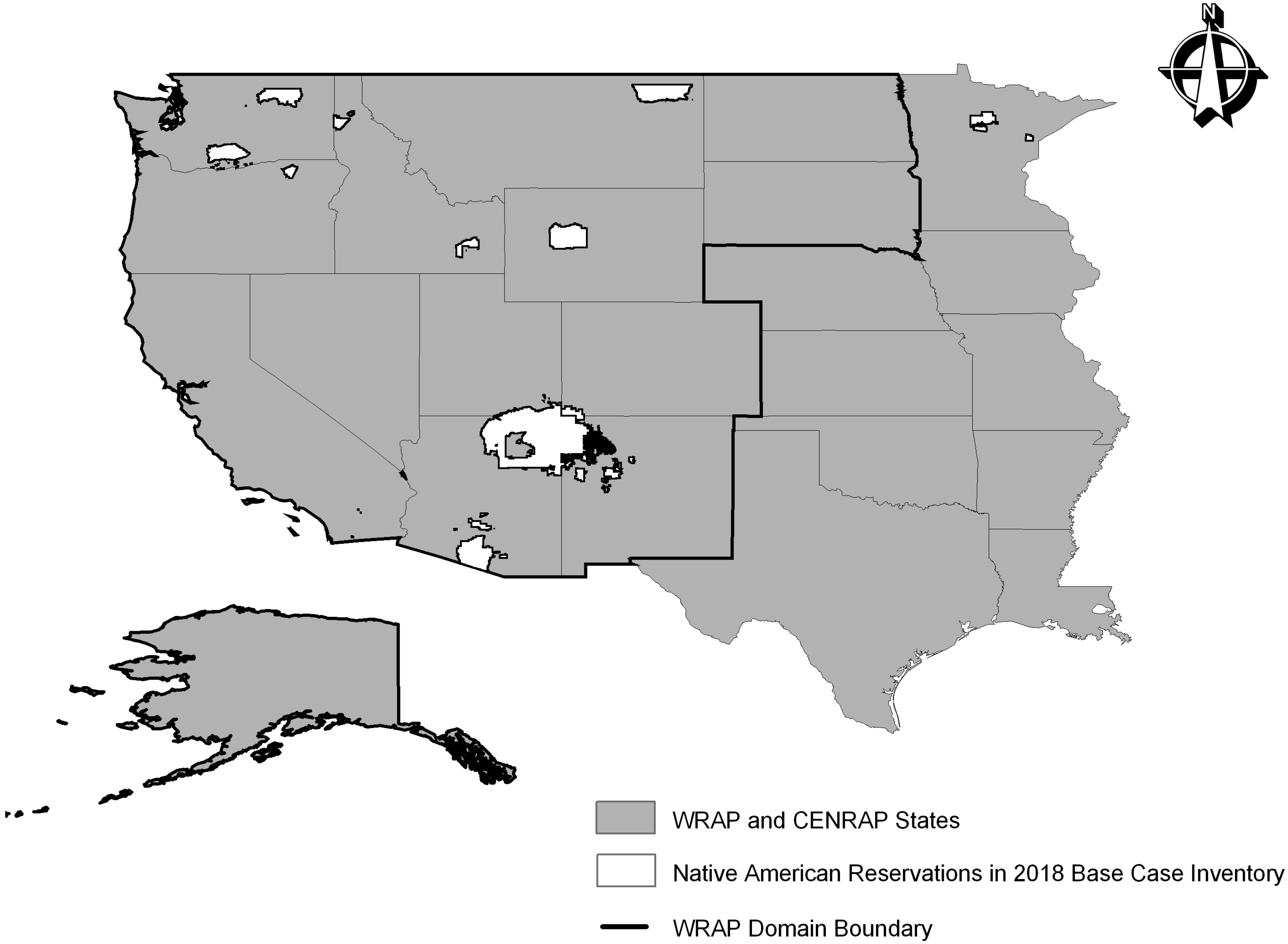
1.1 Inventory Characteristics

The characteristics of this annual emissions inventory for the year 2018 base case are discussed below. The year of 2018 is the year by which the visibility in federal Class 1 areas should be restored to its natural condition. This "attainment" year for visibility is required by the federal Regional Haze Rule (RHR).

The geographic domain covered by this 2018 base case emissions inventory is shown in Figure 1-1 and includes the following:

- WRAP states (AK, AZ, CA, CO, ID, MT, NV, NM, ND, OR, SD, UT, WA, and WY);
- Central Regional Air Planning Association (CENRAP) states (AR, IA, KS, LA, MN, MO, NE, OK, and TX);
- Native American Reservations (NARs) within the WRAP (i.e., the Arapahoe Tribe of the Wind River Reservation, the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, the Cabazon Band of Cahuilla Mission Indians of the Cabazon Reservation, the Coeur d'Alene Tribe of the Coeur d'Alene Reservation, Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Colville Reservation, Confederated Tribes of the Umatilla Reservation, Fort Mojave Indian Tribe of Arizona, Gila River Indian Community of the Gila River Indian Reservation, La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation, Navajo Nation, Pueblo of Laguna, Pueblo of Santa Ana, Salt River Pima-Maricopa Indian Community of the Salt River Reservation, Shoshone-Bannock Tribes of the Fort Hall Reservation, Tohono O'Odham Nation, Ute Mountain Ute Tribe of the Ute Mountain Ute Reservation); and
- NARs within the CENRAP (i.e., Fond du Lac Tribe and the Leech Lake Band of Ojibwe).

Figure 1-1. WRAP and CENRAP States and Tribes Included in the WRAP 2018 Base Case Emissions Inventory



The sources included in the 2018 base case inventory are point sources and area (nonpoint) stationary sources. Certain area source categories that were not included in this project, but were dealt with in other WRAP projects and contracts include the following:

- Fugitive dust from paved and unpaved roads (SCCs 2294xxxxxx, 2296xxxxxx);
- Windblown dust (27014xxxxx, 27301xxxxx);
- Wildfires, waste burning, agricultural burning (SCCs 28015xxxxx, 28100xxxxx); and
- Agricultural production-livestock (SCCs 2805xxxxxx).

Also, no nonroad mobile sources (e.g., commercial marine, locomotives, aircraft, etc.) were included in this inventory of point and area sources.

The pollutants that form the 2018 base case projection inventory are nitrogen oxides (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), carbon monoxide (CO), particulate matter (PM) with an aerodynamic diameter of less than 10 micrometers (µm) (PM_{10}) and less than 2.5 µm ($PM_{2.5}$), and ammonia (NH_3).

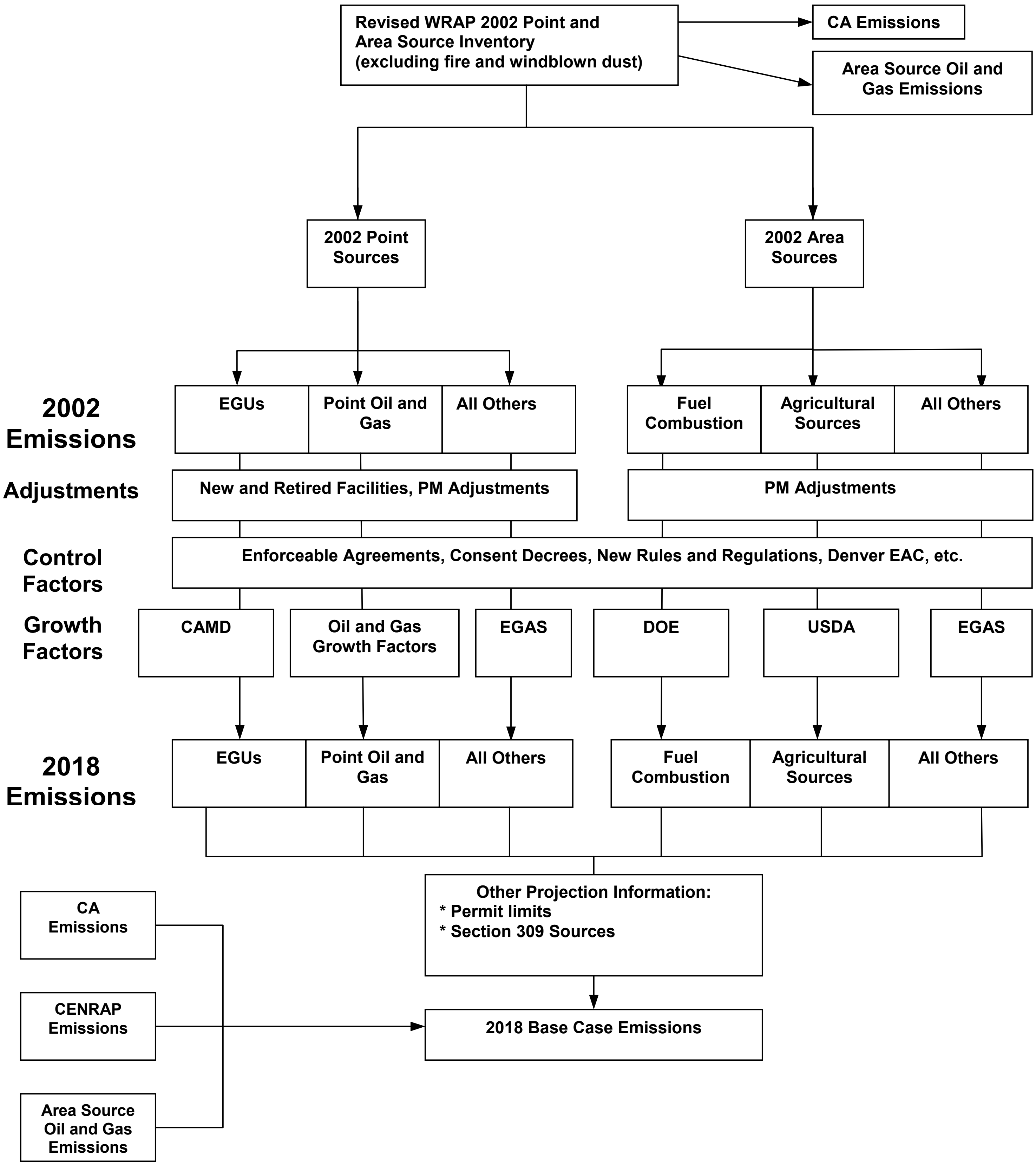
The actual pollutants included in the 2018 base case inventory for a given point or area source category are dependent upon those pollutants included in the 2002 WRAP inventory for that source. For example, if only PM_{10}-Filterable and $PM_{2.5}$-Filterable (and not PM_{10}-Primary and $PM_{2.5}$-Primary) are included in the 2002 inventory for a given source, then only those pollutants are included in the 2018 base case inventory (i.e., no 2002 emissions or pollutants were augmented or gap filled as part of the 2018 task).

1.2 Methodology Overview

Figure 1-2 shows the steps followed to project the WRAP 2002 emissions inventory to the year 2018. The data and calculations for each of the layers in this roadmap were stored in an Excel spreadsheet for each state, and a single spreadsheet for the WRAP tribes. The types of information used in each step are described as follows:

- 2002 Emissions Inventory. This information was taken from the revised 2002 WRAP point and area source inventory updated in Task 1A, and included the following fields:

Figure 1-2. Roadmap for Development of the WRAP 2018 Base Case Inventory



— State and County FIPS

— State facility identifier

— Emission unit ID

— Process ID

— Pollutant code

— Emission release point ID

— Emission numeric value

— Emission unit numerator

— Tribal code

— Primary SIC and NAICS

— Facility name

— City

— SCC

— BART flag (i.e., 1-Yes; 2-Likely; 3-Potential; 4-Do not know; 5-No)

- Adjustments:

  — Emissions for new facilities that have come on-line since 2002

  — Corrections for facilities that retired in 2003 or 2004 and will not return to operation in the future

  — Other (i.e., ratios to correct certain PM_{10} and $PM_{2.5}$ emission factors/SCCs for combustion of natural gas)

- Control Factors: Emission reductions due to known (i.e., on-the-books) controls, consent decrees reductions, SIP control measures, and other relevant regulations that have gone into effect since 2002, or will go into effect before the end of 2018. These controls do not include impacts from any future control scenarios that have yet to be determined.

- Growth Factors: SCC-specific growth factors developed from EGAS projection factor model; special analysis of EGU growth relative to unit capacity threshold.

- Retirement and replacement rates: Effects of retirement estimated using annual retirement rates based on expected equipment lifetimes. Retired equipment replaced by lower-emitting new equipment. Unit lifetimes examined for natural gas-fired EGUs; no retirements for coal-fired EGUs.

- Permit Limits: Used in the cases where the projected emissions may have inadvertently exceeded an enforceable emission limit (i.e., emissions were adjusted downward to the permit limit, as applicable).
- Section 309 Flags: Point sources in the Grand Canyon Visibility Transport States (i.e., AZ, CA, CO, ID, NV, NM, OR, UT, and WY) whose 2002 facility-level SO_2 emissions are at least 100 tons/year.

An extensive data collection effort was conducted to identify the information needs for the adjustments, control factors, growth factors, retirement and replacement rates, and permit limits, etc. needed to develop the various factors and data needed for the projections. The actual data collected, adjustments made, factors calculated, and results are described in detail in the remaining sections of this report.

Part of this WRAP 2018 projection process included numerous telephone conferences with the WRAP SSJF Projections Workgroup, who provided input and feedback on proposed methods for various source sectors, especially electric generating units. A draft 2018 base case inventory was generated and distributed to all affected states and tribal entities for review. Based upon comments received, the 2018 base case was revised and is published in this report. The inventory spreadsheets were used to develop emissions inventory summaries and distribute to the WRAP states, tribes, and other stakeholders as Version 1. The results were formatted using NIF 3.0 for input in to the WRAP Emissions Data Management System (EDMS), and were formatted into IDA format and used in the SMOKE modeling system as part of the “base18a” modeling scenario.

1.3 Contents of this Report

The remainder of this report includes the following sections and content:

- Section 2.0 – Discussion of the adjustments that were made to the 2002 emissions inventory to reflect post-2002 conditions for point and area sources. These include post-2002 changes such as new facilities, retired facilities, and PM emission factor corrections for natural gas combustion.
- Section 3.0 – Explanation of the types of on-the-books controls (factors, emission rates, etc.) that were applied to the 2002 inventory to reflect controls that have been implemented, or will be implemented by 2018 and need to be considered in the 2018 base

case inventory. These include impacts such as the national wood products and refinery initiatives, reductions in emissions due to consent decrees, enforceable agreements, and other regulatory programs.

- Section 4.0 – Details on the growth factors and rates used to project the 2002 inventory forward to 2018. This discussion also covers the details of how the emission projections for California were developed and incorporated into the overall WRAP 2018 base case inventory
- Section 5.0 – Description of the retirement and replacement rates used for the point sources in the WRAP domain to reflect turnover of older equipment with new equipment emitting at (generally) BACT levels.
- Section 6.0 – Explanation of the other information used to develop and report the 2018 base case inventory, including incorporation of permit limits, Regional Haze Rule Section 309 flags for applicable sources, and data formatting.
- Section 7.0 – Results of the 2018 base case inventory at the state and sector levels, including comparisons with the 2002 emissions inventory.
- Section 8.0 – Listing of references used in the development of the 2018 base case inventory.
- Appendix A – Additional 2018 base case inventory (Version 1) summaries.
- Appendix B – Errata, containing a list of potential changes to Version 1 of the 2018 base case inventory.

Also, in addition to this report and its appendices, several sets of electronic files have been delivered under the scope of this project; these include the following:

- Zipped spreadsheets containing the detailed calculations used to develop the 2018 base case emissions inventory (version 1):
  - AK_projections_122105_ver1.xls
  - AZ_projections_122105_ver1.xls
  - CO_projections_122105_ver1.xls
  - ID_projections_122105_ver1.xls
  - MT_projections_122105_ver1.xls
  - ND_projections_122105_ver1.xls
  - NM_projections_122105_ver1.xls

- NV_projections_122105_ver1.xls
- OR_projections_122105_ver1.xls
- SD_projections_122105_ver1.xls
- UT_projections_122105_ver1.xls
- WA_projections_122105_ver1.xls
- WY_projections_122105_ver1.xls
- Tribes_projections_122105_ver1.xls

- Zipped spreadsheet containing growth and control factors provided by the California Air Resources Board: CA_growth_control_2018.xls

2.0 POST-2002 ADJUSTMENTS

To provide the basis for an accurate projections inventory, adjustments were made to the WRAP 2002 point and area source inventory to reflect changes in sources and emissions that have occurred since the 2002. These adjustments had the form of new facilities and emissions, or, in some cases, factors that were multiplied by the 2002 baseline inventory. This section discusses the various types of adjustments made to the 2002 WRAP emissions in order to achieve an up-to-date accounting of actual emissions.

2.1 New, Retired, or Omitted Facilities

Table 2-1 lists the facilities that have either come on-line or have been retired since 2002, facilities (or specific units at facilities) that, for various reasons, needed to be corrected from their 2002 levels (e.g., emissions reported to the U.S. EPA Clean Air Marketing Division [CAMD] database but not included in the 2002 WRAP inventory, uncharacteristically high or low emissions in 2002, duplicate facility record or SCC).

In addition to the new facilities shown on Table 2-1, there were several other new facilities in the WRAP states that even though their existence is known, they could not be added to the projections due to lack of information (e.g., hourly emissions instead of annual emissions, etc.). These included the North Border #5, Manning, Silurian, Golva Compressor Stations in North Dakota; and, the South Pavilion Compressor Station on the Wind River Reservation (Arapahoe Tribe, Wyoming).

2.2 PM/Combustion Emission Corrections

Table 2-2 lists the ratios developed and distributed by U.S. EPA to correct certain natural gas and liquefied petroleum gas combustion emission factors (Huntley, 2005). As it is currently understood, U.S. EPA will apply these ratios when finalizing the 2002 National Emissions Inventory (NEI), thus it was felt that the WRAP inventory should reflect this change as well, and that the most appropriate place to make this change was in the 2018 base case inventory (and not in the 2002 inventory, since this would create an inconsistency with most 2002 state emission inventories.) These ratios were applied at the SCC level to adjust the WRAP 2002 emissions prior to applying

Table 2-1. Summary of New and Retired Facilities, and Other Adjustments

Facility Name	State or Tribe (County FIPS)	Type of Adjustment[a] New	Retire	CAMD Add[b]	Other
El Paso Natural Gas, Casa Grande Compressor Station	AZ (021)	✓			
Cactus Waste Systems	AZ (021)	✓			
APS West Phoenix Power Plant, Units 1, 2, 4, 7, 10, 12	AZ (013)				Added non-CAMD EGUs located at facilities with CAMD EGUs, which were not accounted for 2002 emissions inventory.
Kyrene Generating Station, Units 4, 9, 10, 11, 12, 15, 16,	AZ (013)				
Ocotillo Power Plant, Units 9, 11	AZ (013)				
New Harquahala Generating Company, LLC	AZ (013)	✓			
Mesquite Generating Station	AZ (013)	✓			
PPL Sundance Energy	AZ (021)			✓	
APS Saguaro Power Plant	AZ (021)			✓	
APS West Phoenix Power Plant	AZ (013)	✓			
De Moss Petrie Generating Station	AZ (019)			✓	
Gila River Power Station	AZ (013)	✓			
Griffith Energy LLC	AZ (015)			✓	
San Manuel Smelter and Mill	AZ (021)		✓		
Nucor Steel Kingman LLC (previously North Star Steel AZ)	AZ (015)				Removed (permit terminated)
Blue Spruce Energy Center	CO (001)	✓			
Front Range Power Plant	CO (041)	✓			
Platte River Power Authority – Rawhide (Unit D)	CO (069)	✓			
Rocky Mountain Energy Center	CO (123)	✓			
Public Service Co – Arapahoe (Units 1 and 2)	CO (031)		✓		
Holcim (US) Inc., Fort Collins	CO (069)				Reduced production and emissions after 2002
Manchief Power Company, LLC	CO (087)				Removed (duplicate record)
Mountain Home Generation Station	ID (039)			✓	
Rathdrum Combustion Turbine Project	ID (055)			✓	
Rathdrum Power, LLC	ID (055)			✓	
Bittercreek Pipelines Compressor Station	MT (021)	✓			
Fiberglass Structures	MT (111)	✓			
Specialty Surgical Products	MT (081)	✓			
Glendive Generating Station (GT2)	MT (021)			✓	
Asarco East Helena	MT (049)		✓		
Heating Plant	ND (017)		✓		
Amerada Hess: Dolphin	ND (023)		✓		
Amerada Hess: Antelope #1	ND (053)		✓		
Antelope Plant No. 2	ND (053)		✓		
Bear Paw Energy Inc.: Plaza	ND (061)		✓		
Royal Oak Enterprises, Inc.	ND (089)		✓		

Table 2-1. Cont.

Facility Name	State or Tribe (County FIPS)	Type of Adjustment[a]			
		New	Retire	CAMD Add[b]	Other
Milagro	NM (045)			✓	
Metal Parts Mfg.	NM (013)		✓		
Magnum Compressor Station	NM (015)		✓		
La Rue Compressor Station	NM (015)		✓		
Remediation Project	NM (015)		✓		
Kemnitz Compressor Station	NM (025)		✓		
Lee Gas Plant	NM (025)		✓		
State 35 Compressor Station	NM (025)		✓		
La Maquina	NM (045)		✓		
Blanco Compressor Station	NM (045)		✓		
30-8 CDP Compressor Station	NM (045)		✓		
Las Vegas Cogen	NV (003)	✓			
Mirant Las Vegas, LLC	NV (003)	✓			
Reliant Energy–Bighorn	NV (003)	✓			
Genwest–Silverhawk	NV (003)	✓			
Nevada Power-Harry Allen	NV (003)	✓			
Kernriver-Goodsprings Compressor Station	NV (003)	✓			
El Dorado Energy	NV (003)				Removed (duplicate record)
Tillamook Lumber	OR (059)	✓			
Kinzua Resources, Pilot Rock Sawmill	OR (059)	✓			
Klamath Cogeneration Project	OR (035)			✓	
Klamath Energy, LLC	OR (035)			✓	
Coyote Springs (CTG-2)	OR (049)	✓			
Weyerhaeuser Company	OR (011)		✓		
Huron	SD (005)			✓	
Angus Anson	SD (099)			✓	
Lange	SD (103)			✓	
Nebo Power Station	UT (049)	✓			
Sierra Pacific Industries (SPI)	WA	✓			
Olympic Panel Products (OPP)	WA	✓			
Goldendale Energy Project	WA (039)	✓			
Chehalis Generation Facility	WA (041)	✓			
Frederickson Power LP	WA (053)			✓	
Longview Aluminium, LLC	WA (015)		✓		
Tecnal Corp	WA (057)		✓		
American Millwork Inc. (closed)	WA (033)		✓		
Northwest Manufacturing Inc.	WA (033)		✓		
Meridian Automotive Systems Inc.	WA (033)		✓		
Derby Cycle Corp	WA (033)		✓		
Basin Electric Power Coop - Hartzog Generation Station	WY (005)	✓			
Basin Electric Power Coop - Arvada Generation Station	WY (033)	✓			
Basin Electric Power Coop - Barber Creek Generation Station	WY (005)	✓			

Table 2-1. Cont.

Facility Name	State or Tribe (County FIPS)	Type of Adjustment[a] New	Retire	CAMD Add[b]	Other
Black Hills Corp - WyGen I	WY (005)	✓			
Jonah Gas Gathering - Bird Canyon/Co. Line Compressor Station	WY	✓			
Jonah Gas Gathering - Luman Compressor Station	WY	✓			
Western Gas Resources - Baker Springs/Butcher Compressor Station	WY	✓			
Western Gas Resources - Horse Creek/Gas Draw Compressor Station	WY	✓			
Western Gas Resources - Pronghorn/Oryn Compressor Station	WY	✓			
Western Gas Resources - Sioux/Jr. Reno Compressor Station	WY	✓			
Western Gas Resources - Pumpkin/Bruno Compressor Station	WY	✓			
Jonah Gas Gathering - Falcon Compressor Station	WY	✓			
Burlington Resources - Bighorn Wells	WY	✓			
Chevron USA - Table Rock Field	WY	✓			
Chevron USA - Whitney Canyon/Carter Creek Wellfield	WY	✓			
Exxon Mobil Corporation - Black Canyon Dehydration. Facility	WY	✓			
Black Hills Corp., Simpson 2	WY (005)			✓	
KCS Mountain Resources, Ainsworth Flare	WY (003)		✓		
Belle Fourche Pipeline, South Hilight	WY (005)		✓		
Kinder Morgan Gopher Station	WY (005)		✓		
Astaris Coking Plant	WY (023)		✓		
American Collenoid Upton Plant	WY (045)		✓		
Calpine South Point Energy Center	Tribe-604	✓			

[a] Adjustment may apply to entire facility or to selected emission units at the facility.

[b] CAMD Add = NO_x and SO_2 from natural gas-fired EGUs based on CAMD reports were added to 2018 base case because these were not accounted for in 2002 emissions inventory.

Table 2-2. Correction Ratios for Combustion Emission Factors, by SCC

SCC	SCC_DESC	PM_{10}-PRI ratio	PM_{25}-PRI ratio
10100601	External Combustion Boilers: Electric Generation: Natural Gas: Boilers > 100 Million Btu/hr except Tangential	0.068421	0.056579
10100602	External Combustion Boilers: Electric Generation: Natural Gas: Boilers < 100 Million Btu/hr except Tangential	0.068421	0.056579
10100604	External Combustion Boilers: Electric Generation: Natural Gas: Tangentially Fired Units	0.068421	0.056579
10100701	External Combustion Boilers: Electric Generation: Process Gas: Boilers > 100 Million Btu/hr	0.059770	0.058108
10100702	External Combustion Boilers: Electric Generation: Process Gas: Boilers < 100 Million Btu/hr	0.059770	0.058108
10101001	External Combustion Boilers: Electric Generation: Liquefied Petroleum Gas (LPG): Butane	0.068421	0.056579
10101002	External Combustion Boilers: Electric Generation: Liquefied Petroleum Gas (LPG): Propane	0.068421	0.056579
10101003	External Combustion Boilers: Electric Generation: Liquefied Petroleum Gas (LPG): Butane/Propane Mixture: Specify Percent Butane in Comments	0.068421	0.056579
10200601	External Combustion Boilers: Industrial: Natural Gas: > 100 Million Btu/hr	0.068421	0.056579
10200602	External Combustion Boilers: Industrial Natural Gas: 10-100 Million Btu/hr	0.068421	0.056579
10200603	External Combustion Boilers: Industrial: Natural Gas: < 10 Million Btu/hr	0.068421	0.056579
10200604	External Combustion Boilers: Industrial: Natural Gas: Cogeneration	0.068421	0.056579
10200701	External Combustion Boilers: Industrial: Process Gas: Petroleum Refinery Gas	0.059770	0.049425
10200704	External Combustion Boilers: Industrial: Process Gas: Blast Furnace Gas	0.060465	0.050000
10200707	External Combustion Boilers: Industrial: Process Gas: Coke Oven Gas	0.052000	0.048315
10201001	External Combustion Boilers: Industrial: Liquefied Petroleum Gas (LPG): Butane	0.068421	0.056579
10201002	External Combustion Boilers: Industrial: Liquefied Petroleum Gas (LPG): Propane	0.068421	0.056579
10201003	External Combustion Boilers: Industrial: Liquefied Petroleum Gas (LPG): Butane/Propane Mixture: Specify Percent Butane in Comments	0.068421	0.056579
10201401	External Combustion Boilers: Industrial: CO Boiler: Natural Gas	0.068421	0.056579
10201402	External Combustion Boilers: Industrial: CO Boiler: Process Gas	0.068421	0.056579
10300601	External Combustion Boilers: Commercial/Institutional: Natural Gas: > 100 Million Btu/hr	0.068421	0.056579
10300602	External Combustion Boilers: Commercial/Institutional: Natural Gas: 10-100 Million Btu/hr	0.068421	0.056579
10300603	External Combustion Boilers: Commercial/Institutional: Natural Gas: < 10 Million Btu/hr	0.068421	0.056579
10301001	External Combustion Boilers: Commercial/Institutional: Liquefied Petroleum Gas (LPG): Butane	0.068421	0.056579
10301002	External Combustion Boilers: Commercial/Institutional: Liquefied Petroleum Gas (LPG): Propane	0.068421	0.056579
10301003	External Combustion Boilers: Commercial/Institutional: Liquefied Petroleum Gas (LPG): Butane/Propane Mixture: Specify Percent Butane in Comments	0.068421	0.056579
10500106	External Combustion Boilers: Space Heaters: Industrial: Natural Gas	0.068421	0.056579
10500110	External Combustion Boilers: Space Heaters: Industrial: Liquefied Petroleum Gas (LPG)	0.068421	0.056579
10500206	External Combustion Boilers: Space Heaters: Commercial/Institutional: Natural Gas	0.068421	0.056579

Table 2-2. Cont.

SCC	SCC_DESC	PM_{10}-PRI ratio	PM_{25}-PRI ratio
10500210	External Combustion Boilers: Space Heaters: Commercial/Institutional: Liquefied Petroleum Gas (LPG)	0.068421	0.056579
20100201	Internal Combustion Engines: Electric Generation: Natural Gas: Turbine	0.046269	0.028358
20200201	Internal Combustion Engines: Industrial: Natural Gas: Turbine	0.046269	0.028358
20200203	Internal Combustion Engines: Industrial: Natural Gas: Turbine: Cogeneration	0.046269	0.028358
20300202	Internal Combustion Engines: Commercial/Institutional: Natural Gas: Turbine	0.046269	0.028358
20400301	Internal Combustion Engines: Engine Testing: Turbine: Natural Gas	0.046269	0.028358
27300320	Internal Combustion Engines: Off-highway LPG-fueled Engines: Industrial Equipment: Industrial Fork Lift: Liquefied Petroleum Gas (LPG)	0.068421	0.056579
30290005	Industrial Processes: Food and Agriculture: Fuel Fired Equipment: Liquefied Petroleum Gas (LPG): Process Heaters	0.068421	0.056579
30500209	Industrial Processes: Mineral Products: Asphalt Concrete: Asphalt Heater: LPG	0.068421	0.056579
30590005	Industrial Processes: Mineral Products: Fuel Fired Equipment: Liquefied Petroleum Gas (LPG): Process Heaters	0.068421	0.056579
30600105	Industrial Processes: Petroleum Industry: Process Heaters: Natural Gas-fired	0.068421	0.056579
30600107	Industrial Processes: Petroleum Industry: Process Heaters: LPG-fired	0.068421	0.056579
30890004	Industrial Processes: Rubber and Miscellaneous Plastics Products: Fuel Fired Equipment: Liquefied Petroleum Gas (LPG): Process Heaters	0.068421	0.056579
31000404	Industrial Processes: Oil and Gas Production: Process Heaters: Natural Gas	0.068421	0.056579
31000414	Industrial Processes: Oil and Gas Production: Process Heaters: Natural Gas: Steam Generators	0.068421	0.056579
39000689	Industrial Processes: In-process Fuel Use: Natural Gas: General	0.068421	0.056579
39901001	Industrial Processes: Miscellaneous Manufacturing Industries: Process Heater/Furnace: LPG	0.068421	0.056579
40201004	Petroleum and Solvent Evaporation: Surface Coating Operations: Coating Oven Heater: Liquefied Petroleum Gas (LPG)	0.068421	0.056579
2101006000	Stationary Source Fuel Combustion: Electric Utility: Natural Gas: Total: Boilers and IC Engines	0.068421	0.056579
2101006001	Stationary Source Fuel Combustion: Electric Utility: Natural Gas: All Boiler Types	0.068421	0.056579
2101006002	Stationary Source Fuel Combustion: Electric Utility: Natural Gas: All IC Engine Types	0.068421	0.056579
2101007000	Stationary Source Fuel Combustion: Electric Utility: Liquefied Petroleum Gas (LPG): Total: All Boiler Types	0.068421	0.056579
2102006000	Stationary Source Fuel Combustion: Industrial: Natural Gas: Total: Boilers and IC Engines	0.068421	0.056579
2102006001	Stationary Source Fuel Combustion: Industrial: Natural Gas: All Boiler Types	0.068421	0.056579
2102006002	Stationary Source Fuel Combustion: Industrial: Natural Gas: All IC Engine Types	0.068421	0.056579
2102007000	Stationary Source Fuel Combustion: Industrial: Liquefied Petroleum Gas (LPG): Total: All Boiler Types	0.068421	0.056579
2103006000	Stationary Source Fuel Combustion: Commercial/Institutional: Natural Gas: Total: Boilers and IC Engines	0.068421	0.056579

Table 2-2. Cont.

SCC	SCC_DESC	PM_{10}-PRI ratio	PM_{25}-PRI ratio
2103007000	Stationary Source Fuel Combustion: Commercial/Institutional: Liquefied Petroleum Gas (LPG): Total: All Combustor Types	0.068421	0.056579
2103007005	Stationary Source Fuel Combustion: Commercial/Institutional: Liquefied Petroleum Gas (LPG): All Boiler Types	0.068421	0.056579
2103007010	Stationary Source Fuel Combustion: Commercial/Institutional: Liquefied Petroleum Gas (LPG): Asphalt Kettle Heaters	0.068421	0.056579
2104006000	Stationary Source Fuel Combustion: Residential: Natural Gas: Total: All Combustor Types	0.068421	0.056579
2104006010	Stationary Source Fuel Combustion: Residential: Natural Gas: Residential Furnaces	0.068421	0.056579
2104007000	Stationary Source Fuel Combustion: Residential: Liquefied Petroleum Gas (LPG): Total: All Combustor Types	0.068421	0.056579
2199007000	Stationary Source Fuel Combustion: Total Area Source Fuel Combustion: Liquefied Petroleum Gas (LPG): Total: All Boiler Types	0.068421	0.056579
20100202	Internal Combustion Engines: Electric Generation: Natural Gas: Reciprocating	0.046000	0.057000
20200202	Internal Combustion Engines: Industrial: Natural Gas: Reciprocating	0.046000	0.057000
20200204	Internal Combustion Engines: Industrial: Natural Gas: Reciprocating: Cogeneration	0.046000	0.057000
20200209	Internal Combustion Engines: Industrial: Natural Gas: Turbine: Exhaust	0.046000	0.057000
20200252	Internal Combustion Engines: Industrial: Natural Gas: 2-cycle Lean Burn	0.046000	0.057000
20200253	Internal Combustion Engines: Industrial: Natural Gas: 4-cycle Rich Burn	0.046000	0.057000
20200254	Internal Combustion Engines: Industrial: Natural Gas: 4-cycle Lean Burn	0.046000	0.057000
20200255	Internal Combustion Engines: Industrial: Natural Gas: 2-cycle Clean Burn	0.046000	0.057000
20200256	Internal Combustion Engines: Industrial: Natural Gas: 4-cycle Clean Burn	0.046000	0.057000
20300201	Internal Combustion Engines: Commercial/Institutional: Natural Gas: Reciprocating	0.046000	0.057000
20300203	Internal Combustion Engines: Commercial/Institutional: Natural Gas: Turbine: Cogeneration	0.046000	0.057000
20300204	Internal Combustion Engines: Commercial/Institutional: Natural Gas: Cogeneration	0.046000	0.057000
20300207	Internal Combustion Engines: Commercial/Institutional: Natural Gas: Reciprocating: Exhaust	0.046000	0.057000
20300209	Internal Combustion Engines: Commercial/Institutional: Natural Gas: Turbine: Exhaust	0.046000	0.057000
20301001	Internal Combustion Engines: Commercial/Institutional: Liquified Petroleum Gas (LPG): Propane: Reciprocating	0.046000	0.057000
20301002	Internal Combustion Engines: Commercial/Institutional: Liquified Petroleum Gas (LPG): Butane: Reciprocating	0.046000	0.057000
30290003	Industrial Processes: Food and Agriculture: Fuel Fired Equipment: Natural Gas: Process Heaters	0.046000	0.057000
30590003	Industrial Processes: Mineral Products: Fuel Fired Equipment: Natural Gas: Process Heaters	0.068000	0.057000
30600104	Industrial Processes: Petroleum Industry: Process Heaters: Gas-fired	0.068000	0.057000
30600106	Industrial Processes: Petroleum Industry: Process Heaters: Process Gas-fired	0.068000	0.057000

Source: Huntley, 2005

other factors in subsequent steps. Most of the ratios affect point sources (8-digit SCCs), although some area sources (10-digit SCCs) are affected as well. As the table shows, the impacts are significant, ranging from 92.3 to 95.4 percent decrease in PM_{10}-Primary and 94.2 to 97.2 percent decrease in $PM_{2.5}$-Primary. (Although they are not shown on this table, U.S. EPA also recommended some PM-Condensable ratios).

All of the adjustments shown on Tables 2-1 and 2-2 were applied to the 2002 inventory to achieve an intermediate inventory called "baseline planning inventory." This intermediate inventory was used to check the impact of the adjustments made for reasonableness and quality assurance. The baseline planning inventory was the starting point for estimating the future year projections.

3.0 POST-2002 CONTROL FACTORS

Post-2002 control factors were calculated to reflect impacts from on-the-books controls (i.e., with implementation dates from 2003 to the end of 2018). These control factors are based on expected or actual post-2002 emission reductions from these general areas:

- Compliance with consent decrees (CDs) resulting from enforcement of various federal regulations, such as New Source Review (NSR), Prevention of Significant Deterioration (PSD), and Title V permits, by U.S. EPA;
- Air quality plan impacts from State Implementation Plan (SIP) implementation and other state programs to control air pollution, such as the Denver Early Action Compact (EAC) Ozone Plan, and implementation of Agricultural Best Management Practices in Maricopa County and Salt River SIP in Arizona; and
- Public/private stakeholder agreements for improving air quality, such as the Denver Metro Emissions Reduction Project.

In some cases, the effect of these post-2002 controls did not take the form of a factor, but rather an emission limit, shutdown of equipment, or some other condition. The post-2002 controls applied to the WRAP 2002 inventory to develop the 2018 base case emissions inventory are summarized in Table 3-1.

In addition to the controls summarized in Table 3-1 for which impacts were determined, there was a significant amount of information gathered for other types of control impacts that could not be quantified due to various reasons. Details pertaining to impacts that could not be quantified for some sources are described below.

3.1 National Wood Products Initiative

The wood products industry includes manufacturers of plywood, panelboard, medium density fiberboard (MDF), and oriented strand board. In 1988, the U.S. EPA began investigating the industry for a suspected nationwide pattern of noncompliance with the PSD regulations under the NSR provisions of the Clean Air Act and state rules. Within the WRAP region, settlements were reached with Willamette Industries (2000) and Boise Cascade Corporation (2002)[1]. The

[1] http://www.epa.gov/compliance/resources/cases/civil/caa/wood/index.html

Table 3-1. Summary of Post-2002 Point and Area Source Control Impacts

Plant Name	State or Tribe (County FIPS)	Type of Control Impact and Explanation
British Petroleum – Multiple Facilities (Bandami Development, Central Compressor Plant, Central Gas Facility, Central Power Station, Endicott Production Facility, Flow Station (#1, #2, #3), Gathering Center (#1, #2, #3), Lisburne Production Center, Milne Point Production Facility, Northstar Production Facility, Seawater Injection Plant East, Seawater Treatment Plant, PBU)	AK (185)	Enforceable Agreement: Limits/reduces sulfur content in diesel fuel used at stationary sources to 15 ppm or less before 2018.
ConocoPhillips – Multiple Facilities (Central Production Facility (#1, #2, #3), Kaparuk Seawater Treatment Plant, Alpine Central Processing Facility)	AK (185)	
TEP – Springerville	AZ (001)	Consent Decree: Plant-wide NO_x and SO_2 cap allows continued operation of 2 existing EGUs and construction of 1 new EGUs. Cap with 4 EGUs = 10,800 tons SO_x and 9,600 tons NO_x by 12/31/09.
Agricultural Tillage (SCC 280100003)	AZ (027)	Yuma County PM_{10} SIP: Reduction of 705 tons of PM_{10} due to implementation of agricultural best management practices (BMPs).
Xcel – Comanche	CO (101)	Voluntary Agreement: This agreement allows construction of new EGU and requires NO_x reductions of 25% and SO_2 reductions of 65% by July 09.
Xcel: Arapahoe #1, #2, #3 Cherokee #2, #3, #4 Valmont #5	CO (031) CO (001) CO (013)	Denver Metro Emissions Reduction Project: Agreement sets SO_2 emission reduction target for all plants combined (10,500 tons/year), and stipulates Arapahoe #1 and #2 to be shut down (which occurred 12/31/02). Reductions realized in 2003 with new lime sprayers at Cherokee #3 and #4 and Valmont #5. Increased scrubber efficiency at Arapahoe #3 and Cherokee #2.
Tri State – Craig #1, #2	CO (081)	Visibility SIP: Agreement requires fabric filters to be installed, scrubbers to be upgraded, NO_x reduced through over-fire air upgrades. All by 12/31/04. (Reductions were incorporated through use of 2004 CAMD data for basis of 2018 base case projection.)
Rocky Mountain Steel Mill	CO (101)	Consent Decree: In effect beginning 2005, includes shutdown of electric arc furnace #3 and modification of electric arc furnace #4. New emission limits (i.e., reductions over 2002 emissions) as provided by CDPHE were used for 2018 base case projections.
Condensate tanks at oil and gas wells and production facilities, and natural gas compressor and drip stations.	CO (various)	Denver Early Action Compact: VOC reduction of 47.5% across all sources located in Denver, Jefferson, Douglas, Broomfield, Boulder, Adams, Arapahoe, Weld, Larimer, Morgan, and Elbert counties by 2007.
APS – Four Corners Power Plant	Navajo Nation	Voluntary Agreement: Post-2002 emission reductions for SO_2 and NO_x are reflected in the 2004 CAMD data, and used as basis for 2018 base case projection.

Table 3-1. Cont.

Plant Name	State (County FIPS)	Type of Control Impact and Explanation
SCE – Mohave #1, #2	NV (003)	Consent Decree: Limits SO_2 to 0.15 lb/MMBtu. Heat input limit = 73,925,640 MMBtu/year for each unit. Plant limits for 2 EGUs (per SCE and NDEP) = 19,494 tons NO_x and 8,700 tons SO_2 by 12/31/05.
Nevada Power – Reid Gardner	NV (003)	Agreement is currently under negotiation.
Navajo Refining Co. – Artesia Refinery	NM (015)	Refinery Initiative/Consent Decree: Reductions effective by 2004 include 64% NO_x decrease and 40% SO_2 decrease from catalytic cracking units (SCC 30600201) and 59% NO_x decrease from process heaters fired with process gas (SCC 30600106). Actual reductions provided by Navajo Refining Co.
APS – San Juan Generating Station	NM (045)	Consent Decree: Requires reductions to PM, SO_2, NO_x, and Hg beginning as soon as October 2007 (Unit 4); April 2008 (Unit 3); October 2008 (Unit 1); and March 2009 (Unit 2). Requires ultra low NO_x burner for NO_x (35% reduction); electrostatic precipitator plus fabric filters for PM (70% reduction); SO_2 control efficiency from 83-90% (i.e., 40% increase over current levels of control).
Unnamed Power Plant	ND	Consent Decree: State is currently negotiating terms of CD with an unnamed power plant.
Tesoro (BP Amoco) – Mandan Refinery	ND (059)	Refinery Initiative/Consent Decree: Reductions effective by 2005 include 82% NO_x decrease from process heaters fired with gas (SCC 30600104). Actual reductions provided by North Dakota Department of Health.
Lignite Gas Plant	ND (013)	Both plants are now (2005) injecting all acid gas into deep wells. All SO_2 and other emission from tail gas incinerator are now zero.
Grasslands Plant	ND (053)	
Archer Daniels Midland – Corn Processing	ND (067)	Consent Decree: Reductions of 97 tons/year VOC, 10 tons/year NO_x, and 20 tons/year PM_{10} effective by April 2004.
Boise Cascade – Medford and White City Plants[a]	OR (029)	Wood Products Initiative/Consent Decree: Requires 95% VOC reduction in dryers from installation of regenerative thermal oxidizers (RTOs).
Boise Cascade – Elgin and La Grande Plants[a]	OR (061)	Wood Products Initiative/Consent Decree: Requires 95% VOC reduction in dryers. Regenerative thermal oxidizers (RTOs) installed in 2003.
TransAlta – Centralia Power Plant	WA (041)	Consent Decree: Emission limits of 10,000 tons/year SO_2 (12 month rolling average); 0.30-0.35 lb/mmBTU NO_x; 0.010 g/dscf PM; 200 ppm CO (per calendar year average). All effective 12/31/02.

[a] Actual reductions not taken at White City and La Grande plants due to ambiguity between SCCs in inventory database and as indicated by Oregon DEQ. These reductions total approximately 273 tons in 2004, and could be taken if 2018 base case is revised.

Willamette facilities affected within the WRAP states were located in Bend (now closed), Eugene, Foster, Springfield, and Albany, Oregon. The Boise Cascade facilities affected with the WRAP states were Emmett, Idaho (now closed); Kettle Falls, Washington; and, Island City (La Grande), Elgin, Medford, and White City, Oregon. In general, the settlements with both companies required significant VOC reductions (i.e., 90 to 95 percent), while minimizing NO_x and CO emissions. For the most part, VOC reductions were to be achieved through regenerative catalytic oxidation (RCO) or regenerative thermal oxidation (RTO) installed on the wood/veneer dryers.

All of the operating Willamette facilities have achieved compliance with their respective settlement CDs as of 2002, thus it is not necessary to reflect on-the-books controls. Future VOC control impacts were estimated for the Boise Cascade facilities in Medford and Elgin, Oregon. VOC controls impacts (i.e., 273 tons achieved in 2004) for the Boise Cascade facilities in White City and La Grande, Oregon, were not applied to the 2018 base case inventory due to the inability to match the inventory SCCs with the information provided by Oregon DEQ; however, these could be applied to future versions of the WRAP 2018 emissions inventory, and have been included in Appendix B.

3.2 National Petroleum Refinery Initiative

U.S. EPA's national petroleum refinery initiative is an enforcement and compliance strategy to address air emissions from the nation's petroleum refineries. Since 2000, U.S. EPA has entered into 17 settlements with U.S. companies that refine over 75 percent of the nation's petroleum[2]. The settlements focus on four main areas of the Clean Air Act (CAA):

- NSR/PSD (affecting fluidized catalytic cracking units and heaters and boilers);
- New Source Performance Standards (NSPS) (affecting flares, sulfur recovery units, and fuel gas combustion devices);
- Leak detection and repair requirements; and
- Benzene National Emissions Standards for Hazardous Air Pollutants (NESHAP).

[2] http://www.epa.gov/compliance/resources/cases/civil/caa/oil/index.html

Table 3-2 lists the refineries within the WRAP region with CDs that have been negotiated as part of the national petroleum refinery initiative. As part of the development of the 2018 base case inventory, each CD was reviewed to determine the types of controls, emission limits, applicable equipment, and deadline for achieving reductions. However, most of the CD requirements call for preliminary studies to determine the most feasible and effective types of controls, installation of equipment that meets NSPS requirements, and other types of programmatic approaches. As a result, the specific mass reductions expected (e.g., mainly NO_x, SO_2, and PM) are not provided in the CD, or have yet to be fully negotiated. Of the 14 refineries listed in Table 3-2, specific emission reductions estimates were only available for two: BP Amoco Mandan Refinery and (Navajo Refining) Artesia Refinery; these are included in Table 3-1 (above).

Table 3-2. Refineries in WRAP States Subject to the National Petroleum Refinery Initiative

State	EPA Region	Refinery
CO	8	Conoco (Suncor Energy) Refinery (Denver)
CO	8	Valero (Colorado Refining) Refinery (Denver)
MT	8	Exxon Mobile (Billings)
MT	8	Montana Refining (Great Falls)
MT	8	Conoco Refinery (Billings)
MT	8	Centex Harvest States (Laurel)
ND	8	BP Amoco Mandan Refinery
NM	6	Artesia Refinery
NM	6	Lea Refinery
UT	8	Chevron Salt Lake Refinery
UT	8	BP Amoco Salt Lake City Refinery
WA	10	Equilon-Puget Sound Refining (Anacortes)
WA	10	ConocoPhillips (Ferndale)
WA	10	BP Cherry Point Refinery (Blaine)

3.3 Maximum Achievable Control Technology Standards

An attempt was made to determine the criteria air pollutant (CAP) impacts from implementation of NESHAPs on visibility pollutants emitted by WRAP point and area sources. The maximum achievable control technology (MACT) impacts were assessed by collecting all readily available information on the emission impacts of the rules. Emissions information was gathered from rulemaking preambles and U.S. EPA Fact Sheets supporting each rule, and emissions analyses were obtained for some rules by contacting contractor staff who worked on the rules. After compiling and analyzing these data, it was concluded that credible estimates of MACT impacts could not be developed based on readily available information and that substantial effort would be required to gather the necessary data. As a result, MACT emission reductions from WRAP sources were not estimated.

The most significant challenges associated with assessing MACT impacts on WRAP emission sources included the following:

- Determining CAP pollutant reductions due to NESHAP implementation (i.e., MACT) at the source level is a significant effort involving the determination of the current level of MACT compliance, followed by a unit level emissions and control analysis;
- While MACT reductions in tons of pollutant are available from U.S. EPA rulemaking preambles, Federal Register notices, and Fact Sheets, these are generally done at a national level, using some broad assumptions (e.g., nationwide VOC reductions from a given MACT may be 45 percent, although the actual reduction at a given plant may be 0 percent or 99 percent); and
- Some VOC controls will cause increases in NO_x and SO_2 emissions (e.g., thermal oxidizers will increase NO_x emissions and, if there is sulfur in the exhaust stream as in pulp mills, SO_2 as well), so these impacts would need to be estimated along with reductions in VOC.

A target list of applicable MACT standards was identified using two methods. First, the most significant emitting source categories (SCCs) for NO_x, SO_2, VOC, and PM_{10} in the 2002 inventory were examined for applicable NESHAPs having an implementation of 2003 or later. This review showed that relatively few of the top-emitting categories were affected by new NESHAPs, either because there is not applicable rule (e.g., utility boilers), the rule will impose no emission control requirements (e.g., natural gas-fired industrial boilers), or the compliance date for the rule has already passed (e.g., oil and gas production). The NESHAPs determined to have the potentially greatest impact on high-emitting SCCs in the WRAP region were as follows:

- Reciprocating internal combustion engines (RICE)
- Petroleum bulk stations and terminals
- Petroleum refineries (i.e., fluidized catalytic cracking units [FCCUs], sulfur plants)
- Primary copper smelters

Secondly, a subjective determination was made as to the NESHAPs that were likely to have the largest impact on CAPs in the WRAP region based on the number of potentially affected sources. The NESHAPs determined to affect the greatest number of WRAP sources were as follows:

- Industrial boilers and process heaters (coal-fired)
- Miscellaneous organic NESHAP
- Pulp and paper mills
- Plywood and composition wood products
- Gas turbines
- Miscellaneous metal parts surface coating
- Plastic parts surface coating

Next, using the combined list of MACT standards from above, available information from federal rules and preambles related to national tonnage reductions and/or percentage reduction from MACT implementation was compiled. This presented a challenge because CAP information is not readily available in a useful form from these references. For most source categories, developing more precise information on specific pollutant emission reductions at individual sources or geographic regions would have required research into the rulemaking docket for each rule, which was beyond the scope of this effort. Still, some initial data analysis was performed by which the national tons/year reductions in CAPs were divided by national tons/year emissions from the 2002 NEI for the MACTs covering RICE, plywood and composite wood products, industrial/commercial/institutional boilers and process heaters, primary copper, and pulp and paper production. There was an extremely high level of uncertainty in the results, such as percentage reductions exceeding 100 percent (i.e., MACT tons per year [TPY] reductions exceeded the 2002 NEI TPY) and very insignificant percentage reductions (i.e., due to conditions such as of having MACT already implemented by certain source categories). Also, during the course of this project, other information was gathered pertaining to MACT standards being implemented on a local level. Due to these data limitations, it was decided not to apply MACT reductions to CAP emissions from WRAP sources.

3.4 Other Unquantified Regulatory Impacts

During the data collection process with the state and tribal environmental agencies, several types of control programs were identified as having on-the-books controls that could affect emissions by the year 2018. These are listed as follows, along with the reasons that their impacts could not be quantified:

- Natural Events Action Plans (NEAPs) in Alamosa and Lamar, Colorado. These plans both include several best available control measures (BACM) for fugitive dust control; however, no specific (i.e., SCC-level, annual emissions) were quantified in the SIP document.
- Smelter Rule (R18-2-715) in Arizona. This rule sets hourly SO_2 emission limits at ASARCO Hayden Mill (295 lbs/hour) and Phelps Dodge Miami smelter (604 lbs/hour); however, these limits could not be taken in the projections without a significant assumption of hours/year of operation.
- Salt River (Arizona) PM_{10} SIP emission reductions from "one brick manufacturer." The SIP does not contain enough detail (e.g., facility ID, applicable SCCs) to apply these on-the-books reductions. Also, the SIP indicates emission reductions of non-stack PM_{10} sources from all industrial facilities of 60%, although specific facilities and SCCs are not provided.
- EGUs that have been identified as having potential post-2002 voluntary reductions (i.e., although no specific reductions were applied):
    - Salt River Project (SRP) - Coronado Generating Station, AZ
    - Arizona Electric Power Cooperative - Apache, AZ
    - Nevada Power Company - Reid Gardner, NV
    - Huntington Power Plant, UT
    - Intermountain Generation Station, UT

4.0 GROWTH FACTOR AND RATE ANALYSIS

In addition to post-2002 control factors, the 2018 projections also account for the effects of future growth from 2002 to 2018. The methodologies used to estimate future growth varied depending upon specific source type. For instance, a specialized methodology was developed for coal-fired EGUs in order to incorporate detailed information regarding EGU operation, while a generalized approach was used for the majority of the other sources. The growth factor and rate analysis methodologies are described in detail below.

4.1 Electricity Generating Units

Because EGUs are the largest source of NO_x and SO_2 in the WRAP inventory domain, considerable effort was spent to develop projections for them. In particular, projections were developed on an EGU-by-EGU basis, rather than for the sector as a whole.

The starting point of this effort was the revised 2002 WRAP point sources inventory; all EGU sources were then extracted from the overall inventory. Under a separate task of this project, NO_x and SO_2 emissions data had already been incorporated into the inventory for all EGUs that had continuous emissions monitors (CEMs) and reported to U.S. EPA's Clean Air Markets Division (CAMD) database (identified as "CAMD EGUs") (U.S. EPA, 2005a). The methodology was applied only to CAMD EGUs; EGUs not contained in the CAMD database were treated like other non-EGU point sources (see Section 4.2). Methodology details specific to coal-fired CAMD EGUs are presented in Section 4.1.1, while methodology details for all other CAMD EGUs are described in Section 4.1.2.

4.1.1 Coal-Fired EGUs

After the coal-fired EGUs were extracted from the overall inventory, new coal-fired EGUs that commenced operation after 2002 were added to the inventory (i.e., Wygen 1). Likewise, coal-fired EGUs that retired since 2002 were removed from the list of coal-fired EGU sources (i.e., Arapahoe Units 1 and 2). After the list of CAMD coal-fired EGUs was compiled, then the following data were downloaded from the CAMD website for each of the units[3]:

[3] http://cfpub.epa.gov/gdu

- Nameplate unit capacity (megawatts [MW])
- 2002 gross electricity generation (megawatt-hours [MWh])
- 2002 heat input (million British thermal units [MMBtu])
- 2002 NO_x emissions (tpy)
- 2002 SO_2 emissions (tpy)
- 2004 NO_x emissions (tpy)
- 2004 SO_2 emissions (tpy)

For each CAMD unit, a 2002 capacity factor (CF) was calculated using the following equation:

$$CF = (\text{gross generated electricity [MWh]})/(\text{nameplate unit capacity [MW]} \times 8760 \text{ hours})$$

After calculating the 2002 capacity factor, a capacity threshold (CT) was used to calculate the appropriate growth factor (GF) for each coal-fired EGU. The GF value represents how much growth is needed to project from the current level of operation up to the CT value. The equation used is as follows:

$$GF = CT/CF$$

The capacity threshold represents the theoretical level of generation at which the utilities will need to begin construction of a new EGU to meet additional demand requirements. For coal-fired EGUs, a CT value of 0.85 was assumed based on input from the Projections Work Group. The use of this CT value was based upon historical precedent; the value was previously used many years ago in the WRAP Integrated Assessment System (IAS) and has been carried forward to the present time.

For all pollutants except NO_x and SO_2, the 2002 emissions were then multiplied by the calculated GF value in order to determine the 2018 emissions using the following equation:

$$Emissions_{2018} = Emissions_{2002} \times GF$$

An expanded methodology was utilized for NO_x and SO_2. The calculated GF was multiplied by the 2002 heat input (HI) to obtain a projected 2018 HI:

$$HI_{2018} = HI_{2002} \times GF$$

The most recent full-year (i.e., 2004) NO_x and SO_2 emission rates (ER) in pounds (lbs) per MMBtu were generated by dividing 2004 emissions by 2004 HI as follows:

$ER_{NOx} = Emissions_{NOx,2004}/HI_{2004}$

$ER_{SO2} = Emissions_{SO2,2004}/HI_{2004}$

Based on the guidance of WRAP SSJF, the CAMD 2004 NO_x and SO_2 emission rates, which are the most current full year emission rates for coal-fired EGUs, were used to represent coal-fired EGU operation in 2018. Emissions were calculated as follows:

$Emissions_{NOx,2018} = HI_{2018} \times ER_{NOx}$

$Emissions_{SO2,2018} = HI_{2018} \times ER_{SO2}$

As a final step, projected emissions were reduced by any relevant emission caps or permit limits. The specific emission caps or permit limits are discussed in Section 3.0 and apply to the following facilities:

- Tucson Electric Power (TEP) – Springerville, AZ
- Xcel Energy – Comanche, CO
- Xcel Energy – Arapahoe, CO
- Xcel Energy – Cherokee, CO
- Xcel Energy – Valmont, CO
- Tri-State Generation – Craig, CO
- Arizona Public Service Co. – San Juan, NM
- Southern California Edison (SCE) – Mohave, NV

4.1.2 Other EGUs

The methodology used to project other EGUs was similar to that used for the coal-fired EGUs. As with the coal-fired EGUs, the other EGUs were extracted from the overall inventory with adjustments made for post-2002 new EGUs and retired EGUs. After the list of CAMD EGUs was compiled, then the following data were downloaded from the CAMD website for each of the units:

- Nameplate unit capacity (MW)
- 2002 gross electricity generation (MWh)
- 2002 NO_x emissions (tpy)
- 2002 SO_2 emissions (tpy)

The 2002 capacity factor (CF) was calculated using the following equation:

CF = (gross generated electricity [MWh])/(nameplate unit capacity [MW] × 8760 hours)

After calculating the 2002 capacity factor, a capacity threshold (CT) was used to calculate the appropriate growth factor (GF) for each other EGU. The GF value represents how much growth is needed to project from the current level of operation up to the CT value. The equation used is as follows:

GF = CT/CF

Different CT values were used for the other non-coal fired EGUs depending upon the fuel and technology present. These CT values used were 0.50 for oil-/diesel-fired EGUs, 0.25 for simple cycle natural gas-fired turbines, and 0.60 for natural gas-fired combined cycle EGUs.

For all pollutants, the 2002 emissions were then multiplied by the calculated GF value in order to determine the 2018 emissions using the following equation:

$Emissions_{2018} = Emissions_{2002} \times GF$

4.1.3 Future EGUs

Another unique aspect of the growth analysis for EGUs as compared to other point sources is the identification of future EGUs that will need to be built in order to meet projected electricity demand in 2018. The basis of the projected electricity demand is the Energy Information Administration's (EIA) annual energy projections out to the year 2025 (EIA, 2005). Historical statistics for 2002 and projections for 2018 were obtained from the EIA documentation for 4 of the 13 electricity market module regions:

- Northwest Power Pool (Idaho, Oregon, Utah, Washington, Wyoming; and parts of California, Montana, Nevada, and South Dakota);

- Rocky Mountain Power Area, Arizona, New Mexico, and Southern Nevada (Arizona and Colorado; and parts of Nevada, New Mexico, and Texas);
- Mid-Continent Area Power Pool (North Dakota, Nebraska; and parts of Montana, South Dakota, Minnesota, Iowa, and Wisconsin); and
- California (parts of California).

The analysis of future electricity generation for coal and natural gas is summarized in Table 4-1 and Table 4-2. These generation values do not necessarily correspond to physical locations; rather, they indicate the assignment of EGUs to electricity market module regions.

Table 4-1. Future Electricity Generation Analysis – Coal-Fired EGUs

Growth Parameter	Western States (including CA) (billion kWh)	North Dakota/ South Dakota (billion kWh)
2002 Electricity Generation	223.59	35.11
2018 Electricity Generation	328.31	45.60[a]
Needed Generation	104.72	10.49
Unused Capacity at Existing 2002 Facilities	16.11	0.49
New Capacity at 2003-2004 Facilities	0.66	0.00
Capacity Currently Under Construction	9.61	0.00
Capacity Currently Being Permitted	21.82	0.00
Remaining Capacity to be Allocated	56.54	10.00

[a] Disaggregated from the Mid-Continent Area Power Pool based upon existing generation.

Table 4-2. Future Electricity Generation Analysis – Natural Gas-Fired EGUs

Growth Parameter	Western States (excluding CA) (billion kWh)	CA (billion kWh)	North Dakota/ South Dakota (billion kWh)
2002 Electricity Generation	55.57	93.41	0.14
2018 Electricity Generation	143.81	153.69	0.39[a]
Needed Generation	88.24	60.28	0.25
Unused Capacity at Existing 2002 Facilities	25.66	2.80	0.54
New Capacity at 2003-2004 Facilities	40.61	19.39	0.00
Capacity Currently Under Construction	12.39	31.44	0.00
Capacity Currently Being Permitted	15.98	38.20	0.00
Remaining Capacity to be Allocated	-6.40	-31.55	-0.29

[a] Disaggregated from the Mid-Continent Area Power Pool based upon existing generation.

Coal

As shown in Table 4-1, 115.21 billion kWh of coal-fired electricity generation is projected by EIA for the West in 2018. North Dakota and South Dakota generation is separated out from the rest of the Western states because those two states are on a different power grid and considerable amounts of lignite coal are used. Based upon the growth analysis methodology described in Section 4.1.1, 16.60 billion kWh of this needed generation can be obtained from unused capacity (i.e., capacity between existing 2002 generation and the 0.85 capacity factor). An additional 32.09 billion kWh of coal-fired generation has been identified from facilities that either came on-line in 2003 or 2004, are currently under construction, or are currently being permitted. All of these facilities were added to the 2018 inventory, and are listed in Table 4-3.

Table 4-3. Coal-Fired EGUs that are New (2003 or 2004), Under Construction, or Being Permitted

Facility Name	Current Status	State	County (FIPS)	Nameplate Capacity (MW)
Wygen Station #1	New in 2003/2004	WY	(005)	88
Rocky Mountain Power/Hardin Generating Station	Under Construction	MT	(003)	160
Bull Mountain Plant/Roundup Plant	Under Construction	MT	(065)	750
Wygen Station #2/Black Hills Corp	Under Construction	WY	(005)	100
Two Elk/Bechtel	Under Construction	WY	(005)	280
Springerville #3 and #4	Being Permitted	AZ	(001)	760 (combined)
Comanche #3	Being Permitted	CO	(101)	750
Northern Nevada Energy/Newmont	Being Permitted	NV	(011)	200
NEVCO Energy Company	Being Permitted	UT	(041)	270
Intermountain Power Plant #3	Being Permitted	UT	(027)	950

After considering the facilities listed in Table 4-3, 66.54 billion kWh (i.e., 10.00 billion kWh in North Dakota and South Dakota and 56.54 billion kWh in the remaining WRAP states) of coal-fired electricity generation still remained. Based upon input from the Projections Work Group, it was assumed that a typical future coal-fired EGU has a nameplate capacity of 500 MW and operates up to the capacity threshold of 0.85. It was then estimated that a total of 18 typical future coal-fired EGUs will need to be built prior to 2018, of which 3 will need to be located in North Dakota or South Dakota. The allocation of these future coal-fired EGUs was based upon current state-level capacity (i.e., sum of existing, under construction, and permitted). This allocation is shown in Table 4-4; it should be noted that the allocation for North Dakota and South Dakota was conducted separately from the other WRAP states. It should also be noted that in addition to Oregon, Washington, and South Dakota, no future coal-fired EGUs are expected to be built in California.

Table 4-4. Allocation of Future Coal EGUs

State	2002 Existing (MW)	2004 New (MW)	Under Construction (MW)	Permitted (MW)	Total (MW)	Fraction	No. of Plants	Modified No. of Plants
AZ	3,341	0	0	760	4,101	0.109	1.65	2[a]
CO	5,075	0	0	750	5,825	0.155	2.35	2[a]
ID	0	0	0	0	0	0.000	0.00	1[b]
MT	2,567	0	910	0	3,477	0.092	1.40	1[a]
NM	2,105	0	0	0	2,105	0.056	0.85	1[a]
NV	2,769	0	0	200	2,969	0.079	1.20	1[a]
OR	601	0	0	0	601	0.016	0.24	0[c]
UT	4,745	0	0	1,220	5,965	0.158	2.41	2[a]
WA	1,460	0	0	0	1,460	0.039	0.59	0[c]
WY	5,995	88	380	0	6,463	0.172	2.61	3[a]
Tribes (Navajo)	4,678	0	0	0	4,678	0.124	1.89	2[a]
ND	4,185	0	0	0	4,185	0.902	2.42	3[d]
SD	456	0	0	0	456	0.098	0.26	0[c]
Western (excluding ND/SD)	33,336	88	1,290	2,930	37,644		15.19	15
ND/SD	4,641	0	0	0	4,641		2.69	3

[a]Number of units rounded.
[b]Number of units set to 1 based upon input from state air agency.
[c]Number of units set to 0 to reflect the unlikely siting of coal-fired EGU.
[d]Number of units rounded up.

After allocation of the future coal-fired EGUs at the state-level, the EGUs were then allocated to specific counties. The basis of this allocation was based upon two factors:

- Announcements of plans to build coal-fired EGUs.
- Locations of existing coal-fired EGUs and associated infrastructure.

The two future coal-fired EGUs allocated to Navajo Nation were split between the Arizona and New Mexico portion of that NAR. The county location of the 18 future coal-fired EGUs is presented in Table 4-5.

Table 4-5. County-Level Allocation of Future Coal-Fired EGUs

Assigned EGU Name	State (County FIPS)
Arizona A	AZ (001)
Arizona B	AZ (003)
Colorado A	CO (099)
Colorado B	CO (087)
Idaho A	ID (053)
Montana A	MT (013)
New Mexico A	NM (031)
Nevada A	NV (033)
Utah A	UT (015)
Utah B	UT (047)
Wyoming A	WY (005)
Wyoming B	WY (037)
Wyoming C	WY (009)
Navajo Nation A	AZ
Navajo Nation B	NM
North Dakota A	ND (055)
North Dakota B	ND (057)
North Dakota C	ND (065)

The emission rates used to develop emission estimates for these future new coal-fired EGUs, as well as those currently under construction or being permitted, are presented in Table 4-6.

Natural Gas

As shown in Table 4-2, a total of 148.77 billion kWh of natural gas-fired electricity generation is required by 2018. Based upon the growth analysis methodology described in Section 4.1.2, 29.00 billion kWh of this generation can be obtained from unused capacity. An additional 158.01 billion kWh of natural-gas fired generation has been identified from facilities that either came on-line in 2003 or 2004, are currently under construction, or are currently being permitted. All of these facilities were added to the 2018 inventory. Because the identified generation exceeded the projected 2018 needed generation, no additional future natural gas-fired EGUs are expected to be needed in the WRAP Region. The emission rates used to develop emission estimates for natural gas-fired EGUs that are currently under construction or being permitted are presented in Table 4-7.

Table 4-6. Emission Rates for Future New Coal-Fired EGUs

Pollutant	lb/ton	lb/MMBtu[a]	lb/MWh[b]	Source
NO_x	n/a	0.0900	0.9000	BACT[c]
SO_2	n/a	0.0900	0.9000	BACT[d]
VOC	0.06	0.0022	0.0222	AP-42, Table 1.1-19 (U.S. EPA, 1995)
CO	n/a	0.1500	1.5000	BACT[e]
PM_{10}-PRI	n/a	0.0180	0.1800	BACT[f]
$PM_{2.5}$-PRI	n/a	0.0047	0.0470	AP-42, Table 1.1-6 (U.S. EPA, 1995)

[a] Converted from lb/ton to lb/MMBtu using conversion factor of 13,500 Btu/lb coal.
[b] Converted from lb/MMBtu to lb/MWh using conversion factor of 10,000 Btu/kWh.
[c] Obtained from range of values (0.06 to 0.1) from 12 Western facilities (U.S. EPA, 2005b); value selected with input from Projections Work Group.
[d] Obtained from range of values (0.038 to 0.11) from 12 Western facilities (U.S. EPA, 2005b); value selected with input from Projections Work Group.
[e] Obtained from range of values (0.012 to 0.52) from 12 Western facilities (U.S. EPA, 2005b); value selected with input from Projections Work Group.
[f] Obtained from range of values (0.1 to 0.16) from 12 Western facilities (U.S. EPA, 2005b); value selected with input from Projections Work Group.

Table 4-7. Emission Rates for Future New Natural Gas-Fired EGUs

Pollutant	lb/MMscf	lb/MMBtu[a]	lb/MWh[b]	Source
NO_x	n/a	0.0900	0.6750	BACT[c]
SO_2	0.60	0.0006	0.0043	AP-42, Table 1.4-2 (U.S. EPA, 1995)
VOC	5.50	0.0052	0.0393	AP-42, Table 1.4-2 (U.S. EPA, 1995)
CO	84.00	0.0800	0.6000	AP-42, Table 1.4-1 (U.S. EPA, 1995)
PM_{10}-PRI	7.60	0.0072	0.0543	AP-42, Table 1.4-2 (U.S. EPA, 1995)
$PM_{2.5}$-PRI	7.60	0.0072	0.0543	AP-42, Table 1.4-2 (U.S. EPA, 1995)

[a] Converted from lb/MMscf to lb/MMBtu using conversion factor of 1,050 Btu/scf natural gas.
[b] Converted from lb/MMBtu to lb/MWh using conversion factor of 7,500 Btu/kWh.
[c] Value assumed to be the same as coal.

4.2 Other Point Sources

For all other non-EGU point sources, growth factors were obtained from one of two sources: the EGAS growth factor model or the oil and gas emission task (1B).

4.2.1 EGAS Growth Factor Model

The U.S. EPA's Economic Growth and Analysis System growth factor model (EGAS), Version 5.0 generates SCC-specific growth factors for a specified geographic area, base year (i.e., 2002), and future year (i.e., 2018) using various socio-economic data (U.S. EPA, 2004; Abt, 2004). At the present time, the EGAS model run with default data can only generate growth factors at the state-level. County-level growth factors can be generated by EGAS if detailed county-level socio-economic data are input into the model; however, this was not done for this analysis because these data were not available. Also, although some local demographic data were made available for the projections (i.e., Maricopa County in Arizona, a number of counties in Colorado, and all counties in Utah), EGAS Version 5.0 does not currently allow these data to be input and run without errors. As a result, default modeling was conducted without these demographic data.

Default model runs were made for every state within the inventory with the exception of California; California growth factors are discussed in Section 4.4. Growth factors from the default model runs were matched using SCCs to each inventory record. In the event that an inventory record SCC did not match any of the SCCs in the EGAS output, a growth factor of 1.0000 was assigned. In most cases, unmatched SCCs were caused by the input of incorrect SCCs in the inventory record.

4.2.2 Oil and Gas Growth Factors

As part of Task 1B under the overall WRAP SSJF project, county-specific growth factors for oil and gas production area sources (ENVIRON, 2005). These growth factors were also applied to the point source inventory by mapping the oil and gas area source categories to the corresponding point source SCCs. The oil and gas point sources were limited to the following point source SCCs:

- 310xxxxx
- 404003xx
- 202002xx, 203002xx, or 306xxxxx under SICs 1300, 1311, 1321, 1382, 1389, 4612, 4922, 4923, or 4925

If an SCC/county-specific growth factor did not exist for a particular inventory record, then regional growth factors obtained from EIA forecasts were applied (EIA, 2005). These regional growth factors are presented in Table 4-8.

Table 4-8. Regional 2002 to 2018 Oil and Gas Growth Factors

Region	Oil Production	Gas Production
Rocky Mountain (AZ, CO, ID, MT, ND, NV, SD, UT, WY and western half of NM)	1.334	1.458
Southwest (eastern half of NM and western TX)	0.866	1.354
West Coast (CA, OR, and WA)	0.601	0.568
Alaska	0.876	4.395

4.3 Area Sources

For area sources, growth factors were obtained from one of three sources: the EGAS growth factor model, energy projections from EIA, or agricultural crop projections from the U.S. Department of Agriculture (USDA). The EGAS area source projection factors were obtained in the same manner as the EGAS point source projection factors (see Section 4.2.1). The other two growth factor sources are explained below.

4.3.1 EIA Energy Projections

As discussed in Section 4.1.3, the EIA has issued annual energy projections out to the year 2025 (EIA, 2005). Historical statistics from 2002 combined with projected use quantities for 2018 were used to derive projection factors for use with area source fuel combustion sources. These EIA-based projection factors were used for the following source categories:

- Industrial fuel combustion (SCC 2102xxxxxx)
- Commercial/institutional fuel combustion (SCC 2103xxxxxx)
- Residential fuel combustion (SCC 2104xxxxxx)

4.3.2 USDA Agricultural Projections

Growth factors for agricultural tilling (SCC 2801000003) were obtained from harvested acreage projections developed by USDA (USDA, 2005). The USDA projections covered a 12-year period from 2003 to 2014 and included harvested acreage estimates for eight major field crops (i.e., wheat, barley, corn, rice, oats, soybeans, sorghum, and upland cotton). Extrapolation was used to extend the time series back to 2002 and forward to 2018. The 2002 harvested acreage was estimated to be 226.9 millions acres; while the 2018 harvested acreage was estimated to be 235.1 millions acres. This corresponds to a growth factor of 1.0361.

4.4 California Point and Area Sources

The California 2018 base case emissions were developed using an entirely different methodology than has been described in this report for the other WRAP states. The California Air Resources Board (ARB) used the California Emission Forecasting System (CEFS) to develop California's 2018 base case inventory and provided it directly to the WRAP (Johnson and Lakhanpal, 1997). The California 2018 base case inventory was provided in the CEFS output format shown in Table 4-9.

Table 4-9. CEFS Modeling File Format

Field Length	Field Name	Definition
2	CO	County
3	AB	Air Basin
9	FACID	Facility ID
6	DEV	Device ID
14	PROID	CEIDARS Process ID
4	FYEAR	Forecast Year
16	SCENARIO	Forecast Scenario
4	SUBCO	Sub-County (Not Used)
14	SCC	8-digit SCC for Point Sources, 14-digit EIC for Area Source
14	SIC	4-digit SIC for Point Sources, 14-digit EIC for Area Sources
8	SPATIAL	Spatial Surrogate Name (for Area Sources)
12	AAEMS	Annual Average Emissions
12	SEMS	Summer Average Emissions
12	WEMS	Winter Average Emissions
5	POL	Pollutant Code
2	EMSUNIT	Emissions Units (Tons per Day)
2	UZ	UTM Zone[a]
6	UE	UTM Eastern Coordinate[a]
7	UN	UTM Northern Coordinate[a]
30	FACNAME	Facility Name
30	FACSTREET	Facility Street Location
20	CITY	City
5	ZIP	Zip Code

CEIDARS = California Emission Inventory Development and Reporting System
EIC = Emission inventory code (unique to California)

[a]Although UTM coordinates are a CEFS field, these were not provided to the WRAP.

CEFS uses two separate forecast algorithms: TREND forecast module for aggregating emissions by air district, air basin, and county, and GIS forecast module for developing forecasts at the facility/device/process level for use in gridded inventory inputs for modeling.

TREND module was used to develop the 2018 base case inventory for the WRAP. Within this module, the following factors were applied:

- Temporal factors, or season adjustment factors, for apportioning emissions into "average annual operating day."
- Growth factors from county-specific economic activity profiles, population forecasts, and other socio/demographic activity. Many of the CEFS growth factors were updated in 2001 for the entire state (Pechan, 2001). Also, two air districts, South Coast Air Quality Management District (SCAQMD) and Bay Area Air Quality Management District (BAAQMD) provided their own growth factors to CEFS. Growth factors are region (i.e., air district/air basin/ county) specific. The growth factors used in CEFS for developing WRAP's 2018 base case inventory for California are provided in a spreadsheet accompanying this report.
- Control Factors, provided entirely by the air districts in California, to quantify the impacts of on-the-books controls from ARB regulations, district rules. Control factors comprise three components: control efficiency, rule effectiveness, and rule penetration. The control factors are region, control measure, source category, and pollutant dependent. The control factors used in CEFS for developing the WRAP 2018 base case inventory for California are provided in a spreadsheet accompanying this report.

CEFS 2018 database files for point sources (i.e., 128,425 records; 20,914 facilities) and area sources (i.e., 16,340 records; 618 SCCs across all counties) were provided in the format shown in Table 4-9, in units of tons per day. The pollutants were NO_x, SO_2, reactive organic gases (ROG), CO, PM_{10}, and $PM_{2.5}$. ROG was taken to be equivalent to VOC; no NH_3 emissions were provided.

The following steps were then performed to place the CEFS emissions into the proper format, eliminate inconsistencies with the remaining WRAP inventory, and fill data gaps for required NIF and IDA fields:

- Point Sources:
    - SCCs were checked for validity; invalid SCCs were removed.
    - Tons per day were converted to tons per year by multiplying by 365.
    - PM_{10} and $PM_{2.5}$ records were adjusted according to the U.S. EPA correction factors for natural gas combustion (see Section 2.2).
    - Latitude/longitude coordinates were assigned to the 2018 records using information from California's 2002 inventory (compiled under Task 1A of this

project). County centroids were assigned to 2018 sources that could not be matched to 2002 records.

— Area Sources:
  - Certain EICs were removed, as these are not included in this particular inventory effort (i.e., wildfires, prescribed burning, forest fires, rangeland burning, agricultural burning, and windblown dust).
  - Remaining EICs were mapped to SCCs.
  - Tons per day were converted to tons per year by multiplying by 365.

After these steps were completed, then the California files were converted to NIF3.0 and IDA formats for use in subsequent steps of the 2018 base case inventory process.

5.0 POINT SOURCE RETIREMENT AND REPLACEMENT

In addition to controls and growth, the 2018 projected inventory also includes the effects of point source retirement and replacement. The assumptions used to apply the concepts of point source retirement and replacement were handled as follows:

- All point sources have a finite lifetime (of 'x' number of years);
- Upon reaching that finite lifetime, a point source will be retired;
- A retired point source will be replaced by a point source of similar size;
- The new replacement point source will have lower controlled emissions than the emissions from the retired point source; and
- Point source retirement/replacement is entirely separate from future growth.

Because future year emission rates could not be quantified for some source types, point source retirement/replacement was only applied to a limited number of source types (i.e., SCCs). The general methodology is outlined below, along with specific modifications that were made for the special case of EGUs.

5.1 SCC Identification

Retirement and replacement was applied for a subset of the point sources contained in the 2002 WRAP inventory. A list of the point sources and SCCs is provided in Table 5-1 along with expected facility lifetime, annual retirement rate, and projection retirement rate. The annual retirement rate is the percentage of sources under a particular SCC that are expected to retire in a given year; the annual retirement rate is defined as (1/lifetime). For example, an SCC with an expected lifetime of 50 years has an annual retirement rate of 0.02 (i.e., 1/50 years). The projection retirement rate is the percentage of sources under a particular SCC that are expected to retire over the period of the projection (i.e., from 2002 to 2018, or 16 years). In the case of the SCC example above, the projection retirement rate is 0.32 (i.e., 0.02 × 16 years).

Table 5-1 Retirement and Replacement SCCs, Lifetimes, and Retirement Rates

Category	Applicable SCCs	Lifetime (years)[a]	Annual Retirement Rate	Projection Retirement Rate
Utility Oil Boiler	101004xx, 101005xx, 10102101, 10101302	60	0.0167	0.2667
Utility Natural Gas Boilers	101006xx	60	0.0167	0.2667
Utility Renewable Boilers	10101501, 10101502, 10101801	60	0.0167	0.2667
Utility Oil Turbine	20100101, 20100108, 20100109, 20101302	30	0.0333	0.5333
Utility Natural Gas Turbine	20100201, 20100208, 20100209	30	0.0333	0.5333
Utility Cogeneration	10200219, 10200229, 10200307, 10200405, 10200505, 10200604, 10200710	45	0.0222	0.3556
Industrial Coal Boilers	102001xx, 102002xx, 102003xx, 10500102	45	0.0222	0.3556
Industrial Oil Boilers	102004xx, 102005xx, 10201302, 10500105, 10500113, 10500114	45	0.0222	0.3556
Industrial Natural Gas Boilers	102006xx, 10500106	30	0.0333	0.5333
Industrial Wood Boilers	102009xx	45	0.0222	0.3556
Industrial Oil Turbines	20200101, 20200103, 20200108, 20200109	30	0.0333	0.5333
Industrial Natural Gas Turbines	20200201, 20200203, 20200208, 20200209	30	0.0333	0.5333
Industrial IC Engines	All other 202002xx	30	0.0333	0.5333
Oil and Gas Production	310002xx	30	0.0333	0.5333
Cement Kilns	305006xx	32.5	0.0308	0.4923
Petroleum Refining	30600105, 30600201, 30600202	30	0.0333	0.5333

[a] Source: Pechan, 2001.

For each of the SCCs listed in Table 5-1, reduction factors were developed for NO_x, SO_2, and PM_{10}. These factors were based on the expected reduction as an uncontrolled source is retired and replaced by a new controlled source. Reduction factors are presented in Table 5-2; a blank cell indicates that a reduction factor either could not be found or could not be quantified. The information used to develop the reduction factors is provided in Table 5-3. Reduction factors were calculated using the following equation:

Reduction Factor = (Retired Rate – Replacement Rate)/(Retired Rate)

As an example, the reduction factor for PM_{10} from industrial coal boilers was calculated as follows:

Reduction Factor = (0.051 lb/MMBtu – 0.03 lb/MMBtu)/0.051 lb/MMBtu = 0.412

The effects of retirement and replacement were applied as a sector-wide adjustment to each record in that sector based on SCC. In addition, if a particular SCC had reduction factors applied to it, then the reduction factors were also applied to new growth as well. This is shown in the following equations where R is equal to the retirement rate, G is the growth rate, and C is the reduction rate for a particular pollutant:

Total 2018 Emissions = Unretired 2002 Emissions + Retired/Replaced 2002 Emissions + Grown 2018 Emissions

Total 2018 Emissions = (2002 Emissions × [1 – R]) + (2002 Emissions × R × [1 – C]) + (2002 Emissions × [G – 1] × [1 – C])

5.2 Modifications to Methodology for EGUs

The retirement/replacement methodology described above was applied to all point sources that matched the SCCs in Table 5-1. The one key exception was for EGUs. Instead of applying annual retirement rates to EGUs, the age of the EGU based upon known start-up dates was compared to expected lifetimes as shown in Table 5-1 (U.S. EPA, 2005a). If the age of any EGU exceeded its expected lifetime in 2018, then that EGU was assumed to be replaced by a similarly-sized EGU grown up to capacity (as described in Section 4.1) with the appropriate reduced emission rates. If the start-up date of an EGU was not known, then the methodology presented in Section 5.1 was used instead.

Table 5-2. Retirement and Replacement Reduction Factors

Category	Applicable SCCs	NO_x	SO_2	PM_{10}
Utility Oil Boiler	101004xx, 101005xx, 10102101, 10101302	0.633		0.500
Utility Natural Gas Boilers	101006xx	0.640		0.500
Utility Renewable Boilers	10101501, 10101502, 10101801	0.267		0.500
Utility Oil Turbine	20100101, 20100108, 20100109, 20101302	0.267		0.500
Utility Natural Gas Turbine	20100201, 20100208, 20100209	0.720		0.500
Utility Cogeneration	10200219, 10200229, 10200307	0.756		0.500
	10200405, 10200505	0.633		
	10200604, 10200710	0.640		
Industrial Coal Boilers	102001xx, 102002xx, 102003xx, 10500102	0.500	0.900	0.412
Industrial Oil Boilers	102004xx, 102005xx, 10201302, 10500105, 10500113, 10500114	0.500	0.900	0.700
Industrial Natural Gas Boilers	102006xx, 10500106	0.500	0.900	
Industrial Wood Boilers	102009xx	0.500		0.700
Industrial Oil Turbines	20200101, 20200103, 20200108, 20200109	0.500	0.900	
Industrial Natural Gas Turbines	20200201, 20200203, 20200208, 20200209	0.500		
Industrial IC Engines	All other 202002xx	0.900		
Oil and Gas Production	310002xx	0.900		
Cement Kilns	305006xx	0.300		
Petroleum Refining	30600105	0.500		
	30600201, 30600202	0.600	0.850	

Table 5-3. Information Used to Develop Retirement and Replacement Reduction Factors (lb/MMBtu)

Category	Applicable SCCs	NO_x (Retired Rate)	NO_x (Replace Rate)	SO_2 (Retired Rate)	SO_2 (Replace Rate)	PM_{10} (Retired Limit)	PM_{10} (Replace Rate)
Utility Oil Boiler	101004xx, 101005xx, 10102101, 10101302	0.3[a]	0.11[b]			0.03[e]	0.015[b]
Utility Natural Gas Boilers	101006xx	0.25[a]	0.09[b,c]			0.03[e]	0.015[b]
Utility Renewable Boilers	10101501, 10101502, 10101801	0.15[a]	0.11[b]			0.03[e]	0.015[b]
Utility Oil Turbine	20100101, 20100108, 20100109, 20101302	0.15[a]	0.11[b]			0.03[e]	0.015[b]
Utility Natural Gas Turbine	20100201, 20100208, 20100209	0.32[a]	0.11[b]			0.03[e]	0.015[b]
Utility Cogeneration	10200219, 10200229, 10200307	0.45[a]	0.11[b]			0.03[e]	0.015[b]
	10200405, 10200505	0.3[a]	0.11[b]			0.03[e]	0.015[b]
	10200604, 10200710	0.25[a]	0.09[b,c]			0.03[e]	0.015[b]
Industrial Coal Boilers	102001xx, 102002xx, 102003xx, 10500102		0.2[b,e]		[f]	0.051[g]	0.03[b]
Industrial Oil Boilers	102004xx, 102005xx, 10201302, 10500105, 10500113, 10500114		0.2[b,e]		[f]	0.1[g]	0.03[b]
Industrial Natural Gas Boilers	102006xx, 10500106		0.2[b,e]		[f]		
Industrial Wood Boilers	102009xx		0.2[b,e]			0.1[g]	0.03[b]
Industrial Oil Turbines	20200101, 20200103, 20200108, 20200109		0.2[b,e]		[f]		
Industrial Natural Gas Turbines	20200201, 20200203, 20200208, 20200209		0.2[b,e]				
Industrial IC Engines	All other 202002xx		[h]				
Oil and Gas Production	310002xx		[h]				
Cement Kilns	305006xx		[i]				
Petroleum Refining	30600105		0.2[b,e]				
	30600201, 30600202		[j]		[j]		

[a]Retired NSPS values (1979-1997) obtained from 40 CFR 60.44a.
[b]Proposed future NSPS values obtained from 70 FR 9706-9735.
[c]Adjusted from 0.11 lb/MMBtu down to 0.09 lb/MMBtu to reflect more realistically achievable rates.
[d]Retired NSPS values (1979-2005) obtained from 40 CFR 60.42a.
[e]Limit based on selective catalytic reduction (SCR) and estimated to represent 50 percent reduction from combustion-controlled units (40 CFR 60.44b).
[f]Assumed 90 percent reduction of uncontrolled sources based on 40 CFR 60.42b and 70 FR 9706-9735.
[g]Retired NSPS values (1986-2005) obtained from 40 CFR 60.43b.
[h]Reduction based on BACT non-selective catalytic reduction (NSCR).
[i]Reduction based on ERG work for U.S. EPA on cement kiln BACT analysis.
[j]Reductions based on ERG work for U.S. EPA on National Petroleum Refinery Initiative.

Further input from the WRAP SSJF Projections Work Group and other stakeholders indicated that the retirement/replacement methodology used for other point sources was not appropriate for coal-fired EGUs (i.e., no coal-fired EGUs in the WRAP region are expected to retire by 2018). Therefore, no retirement/replacement effects were applied to the coal-fired EGUs in the inventory.

6.0 OTHER INFORMATION USED TO DEVELOP THE 2018 BASE CASE PROJECTIONS

After application of the various adjustments and factors discussed in above, an intermediate inventory value (i.e., "Initial 2018 Base Case") was calculated. This intermediate inventory value was used to evaluate and indicate other information, which is discussed below.

6.1 Permit Limits

During review the draft 2018 base case, relevant state and tribal agencies and stakeholders were asked to compare permit limits for their point sources and equipment, to ensure that the projection method did not inadvertently cause the result predicted for 2018 to exceed any permit limit. In some cases, this was found to occur; the agency provided the permit limit(s) and the 2018 base case was adjusted in the "Permit Limit" column of the calculation spreadsheets for each relevant state.

6.2 Section 309 Flags

The WRAP SSJF requested that the 2018 base case projections data files to include a flag to indicate the sources subject to Section 309 requirements of the Regional Haze Rule. These include point sources located in the nine GCVTC states (AZ, CA, CO, ID, NV, NM, OR, UT, and WY) and having SO_2 emissions of 100 tons/year or more. To indicate Section 309 eligibility, a "Y" flag was placed in the Section 309 flag column of the calculation spreadsheets for each relevant state and source, based on 2002 facility-level emissions. Table 6-1 lists these facilities. One facility with SO_2 emissions of 97 tons/year was also included in Table 6-1 because it was listed in the 2003 SO_2 Milestone report (WRAP, 2005) and its projected 2018 emissions exceed 100 tons/year.

Also, Table 6-2 was developed for the purpose of comparing the sources subject to Section 309 (as shown in Table 6-1) to the sources identified in Appendix A-1 of the 2003 SO_2 Milestone report. All of the facilities listed in Table 6-2 were not flagged as Section 309 eligible (in Table 6-1) because their 2002 SO_2 emissions were less than 100 tons, including those that came on-line after 2002 or were not in the 2002 inventory at all.

Table 6-1. WRAP Facilities Subject to RHR Section 309 Requirements, Based on 2002 Emissions

Tribe or State	County FIPS	Tribal or State Facility/ 2002 EI Identifier	Plant SIC	Facility Name	2002 SO_2 Emissions (Tons)	In 2003 SO_2 Milestone Report (A-1)
Arapahoe Tribe of the Wind River Reservation	0	V-WR-0003-00.02		Peak Sulfur Inc (WY)	897	
Navajo Nation	0	NN-OP 99-03	1321	ChevronTexaco, Aneth Natural Gas Processing Plant (UT)	118	
Navajo Nation	0	EGU0037	4911	Navajo Generating Station (AZ)	4,007	
Navajo Nation	0	EGU0793	4911	Four Corners Power Plant (NM)	32,847	
AZ	04001	EGU0034	4911	SRP Coronado Generating Station	17,727	✓
AZ	04001	EGU0035	4911	TEP – Springerville	19,862	✓
AZ	04003	EGU0036	4911	AEPCO - Apache Generating Station	5,167	✓
AZ	04007	0400701391		Phelps Dodge – Miami	5,667	✓
AZ	04007	040072435	3331	Ray Complex - Smelter and Mill	18,438	✓
AZ	04017	040171807	4911	Snowflake Pulp Mill	1,519	✓
AZ	04017	EGU0045	4911	Cholla Power Plant	20,770	✓
AZ	04019	0425	4931	Tucson Electric Power	113	
AZ	04019	EGU0047	4911	TEP - Irvington	3,119	✓
AZ	04025	040252393	3241	Phoenix Cement	270	✓
AZ	04025	040255992	3274	Nelson Lime Plant	707	✓
CA	06001	1130383	3321	United States Pipe & Foundry C	151	
CA	06001	1130311362	3221	Owens Brockway Glass Container	187	
CA	06013	7130323	2819	General Chemical Corporation	224	
CA	06013	7130311661	2819	Rhodia Inc	419	
CA	06013	7130316	2911	Conocophillips - San Francisco	1,130	
CA	06013	7130311	2911	Shell Martinez Refinery	1,466	
CA	06013	7130322	2999	Tosco Refining Company	1,766	
CA	06013	7130310	2911	Chevron Products Company	1,829	
CA	06013	7130314628	2911	Tesoro Refining And Marketing	5,941	
CA	06019	101430311	1311	Chevron Usa Inc	115	
CA	06019	101430598	3211	Guardian Industries Corp	379	
CA	06029	15143037	2911	Kern Oil & Refining Company	140	
CA	06029	1514301141	1311	Chevron Usa Inc	401	

Table 6-1. Cont.

Tribe or State	County FIPS	Tribal or State Facility/ 2002 EI Identifier	Plant SIC	Facility Name	2002 SO_2 Emissions (Tons)	In 2003 SO_2 Milestone Report (A-1)
CA	06029	1505129	3241	California Portland Cement Co.	929	
CA	06037	19102625070	4953	La Co., Sanitation District	119	
CA	06037	19102647232	3463	Arco Cqc Kiln	163	
CA	06037	1910267427	3221	Owens-Brockway Glass Container	177	
CA	06037	191026180001	4581	Los Angeles International	186	
CA	06037	191026114801	2819	Rhodia Inc.	210	
CA	06037	191026800362	2911	Tosco Refining Company	423	
CA	06037	191026800370	2911	Equilon Enterprises, Llc	703	
CA	06037	191026800026	2911	Ultramar Inc (Nsr Use Only)	726	
CA	06037	191026800363	2911	Tosco Refining Company	736	
CA	06037	191026800089	2911	Mobil Oil Corp	816	
CA	06037	191026800030	2911	Chevron U.S.A. Inc.	1,227	
CA	06037	191026131003	2911	West Coast Products Llc	1,576	
CA	06039	201430801	3221	Saint-Gobain Containers, Inc	116	
CA	06071	36051850001051	4911	Ace Cogeneration Co.	175	
CA	06071	361026800181	3241	California Portland Cement Co	181	
CA	06071	3605181200003	3241	Txi Riverside Cement Company	219	
CA	06071	36051811800001	3241	Mitsubishi Cement 2000	229	
CA	06071	360518100005	3241	Cemex – Black Mountain Quarry	427	
CA	06077	391430802	4931	Stockton Cogen Company	167	
CA	06077	391430593	3221	Owens-Brockway Glass Container	240	
CA	06077	391430767	2873	J R Simplot Company	313	
CA	06077	391430477	3211	Pilkington North America, Inc	314	
CA	06079	40113113	2911	Conoco Phillips Santa Maria Fa	3,760	
CA	06083	4211251735	3295	Celite Corporation	1,111	
CA	06085	43130317	3241	Hanson Permanente Cement	555	
CA	06087	4407151186	3241	Rmc Pacific Materials	722	
CA	06095	48130312626	2911	Valero Refining Company - Cali	7,009	
CA	06099	5014301662	3221	Gallo Glass Company	233	
CO	08001	0004	2911	Colorado Refining Co., Total Petroleum	394	
CO	08001	0003	2911	Suncor Energy - Denver Refinery	2,189	

Table 6-1. Cont.

Tribe or State	County FIPS	Tribal or State Facility/ 2002 EI Identifier	Plant SIC	Facility Name	2002 SO_2 Emissions (Tons)	In 2003 SO_2 Milestone Report (A-1)
CO	08001	EGU0163	4911	Public Service Co Cherokee Plt	15,957	
CO	08013	EGU0164	4911	Public Service Co – Valmont	3,786	
CO	08031	BSCP157	3251	Robinson Brick Co	169	
CO	08031	EGU0165	4911	Public Service Co – Arapahoe	5,107	
CO	08041	EGU0169	4911	Colorado Springs Utilities-Nixon Plant	4,968	
CO	08041	EGU0167	4911	Colorado Springs Utilities-Drake Plant	8,530	
CO	08043	0001	3241	Holcim (Us) Inc. Portland Plant	242	
CO	08043	0003	4911	Aquila, Inc. – W.N. Clark Station	1,463	
CO	08059	0008	3221	Rocky Mountain Bottle Co	314	
CO	08059	0820	4961	Trigen - Colorado Energy Corporation	2,342	
CO	08069	0002	3241	Holcim (Us) Inc - Fort Collins Plant	378	
CO	08069	EGU0173	4911	Platte River Power Authority – Rawhide	898	
CO	08077	EGU0174	4911	Public Service Co Cameo Plt	2,095	
CO	08081	EGU0175	4911	Tri State Generation Craig	10,391	
CO	08085	EGU0176	4911	Tri State Generation Nucla	1,487	
CO	08087	EGU0179	4911	Public Service Co Pawnee Plt	14,833	
CO	08101	0048	3312	Cf&I Steel L P Dba Rocky Mtn Steel Mills	267	
CO	08101	EGU0182	4911	Public Service Co Comanche Plt	16,773	
CO	08107	EGU0183	4911	Public Service Co Hayden Plt	2,868	
ID	16027	02700010	2063	Tasco, Nampa	1,852	
ID	16029	02900003	2874	Nu West Industries	364	
ID	16029	02900001	2819	P4 Production LLC	12,210	
ID	16067	06700001	2063	Tasco, Paul	249	
ID	16077	07700006	2874	Jr Simplot Company Don Siding Complex	1,609	
ID	16083	08300001	2063	Tasco, Twin Falls	1,018	
NV	32003	0003	3275	Chemical Lime Company	178	
NV	32003	EGU0742	4911	Nevada Power Company	1,977	
NV	32003	EGU0744	4911	Southern California Edison	40,347	
NV	32007	AP32740261	3274	Graymont Western Us Inc	251	
NV	32011	AP10410404	1041	Newmont Gold Company	103	
NV	32011	AP10410739	1041	Barrick Goldstrike Mines Inc	193	

Table 6-1. Cont.

Tribe or State	County FIPS	Tribal or State Facility/ 2002 EI Identifier	Plant SIC	Facility Name	2002 SO_2 Emissions (Tons)	In 2003 SO_2 Milestone Report (A-1)
NV	32013	AP10410451	1041	Sante Fe Pacific Gold Corporation	107	
NV	32013	EGU0749	4911	North Valmy Station	6,874	
NV	32019	AP32410387	3241	Nevada Cement Company	175	
NM	35001	0001		Rio Grande Portland Cement	1,109	✓
NM	35007	350070001	4911	Raton Power Plant	201	✓
NM	35015	350150285	1321	Dagger Draw Gas Plant	170	✓
NM	35015	350150011	1321	Artesia Gas Plant	838	✓
NM	35015	350150010	2911	Artesia Refinery	1,975	✓
NM	35015	350150008	1311	Indian Basin Gas Plant	2,040	✓
NM	35015	350150024	1311	Agave Gas Plant	2,099	✓
NM	35025	350250063	1321	Saunders Plant	271	✓
NM	35025	350250007	1311	Denton Plant	295	✓
NM	35025	350250060	1321	Eunice Gas Plant	393	✓
NM	35025	350250061	1321	Monument Plant	838	✓
NM	35025	350250035	1321	Linam Ranch Gas Plant	931	✓
NM	35025	350250008	1321	Jal No. 3	1,206	✓
NM	35025	350250044	1321	Eunice Gas Plant	1,330	✓
NM	35025	350250004	1321	Maljamar Gas Plant	2,491	✓
NM	35031	350310008	2911	Ciniza Refinery	1,102	✓
NM	35031	EGU0792	4911	Escalante Station	1,192	✓
NM	35045	350450247	1321	San Juan River Gas Plant	504	✓
NM	35045	350450023	2911	San Juan Refinery (Bloomfield)	560	✓
NM	35045	EGU0794	4911	San Juan Fly Ash	16,768	✓
OR	41007	00004	4961	Fort James Operating Company	1,323	✓
OR	41009	01849	4961	Boise Cascade Corporation	1,144	✓
OR	41041	00005	4961	Georgia-Pacific West, Inc.	307	✓
OR	41043	03501	4961	Pope & Talbot, Inc.	97	✓
OR	41043	00471	4961	Weyerhaeuser Company	443	
OR	41045	00002	4961	Amalgamated Sugar Company, The	813	✓
OR	41049	EGU0971	4911	Portland General Electric Company	12,262	✓
OR	41051	01876	3221	Owens-Brockway Glass Container Inc.	109	✓

Table 6-1. Cont.

Tribe or State	County FIPS	Tribal or State Facility/ 2002 EI Identifier	Plant SIC	Facility Name	2002 SO_2 Emissions (Tons)	In 2003 SO_2 Milestone Report (A-1)
OR	41071	06142	4961	Smurfit Newsprint Corporation	547	✓
UT	49007	10096	4911	Sunnyside Cogeneration Facility	1,013	✓
UT	49007	EGU1218	4911	Carbon Power Plant	6,764	✓
UT	49011	10122	2911	Flying J Refinery (Big West Oil Co.)	281	✓
UT	49011	10123	2911	Phillips Refinery	452	✓
UT	49011	10119	2911	Salt Lake Refinery	1,332	✓
UT	49015	EGU1220	4911	Hunter Power Plant	7,026	✓
UT	49015	EGU1221	4911	Huntington Power Plant	13,710	✓
UT	49027	10311	1099	Delta Mill	123	✓
UT	49027	10313	3274	Cricket Mountain Plant	310	✓
UT	49027	EGU1222	4911	Intermountain Generation Station	3,648	✓
UT	49035	12096	1531	I-15 Corridor Reconstruction	103	
UT	49035	10335	2911	Salt Lake City Refinery	712	✓
UT	49035	10346	3331	Kennecott Smelter & Refinery	939	✓
UT	49035	10572	1021	Kennecott Utah Copper Corp -Power Plt/ Lab/ Tailings Impoundment	2,788	✓
UT	49037	10034	1311	Lisbon Natural Gas Processing Plant	1,453	✓
UT	49043	10676	3295	Shale Processing	117	✓
UT	49047	EGU1224	4911	Bonanza Power Plant	981	
UT	49049	10796	4911	Geneva Steel Manufacturing Facility	108	✓
UT	49049	10790	8221	BYU Main Campus	142	✓
WY	56001	5600100005	4911	University of Wyoming, Heat Plant	189	✓
WY	56001	5600100002	3241	Mountain Cement Co	207	✓
WY	56003	00016		Kcs Mountain Resrcs-Rushmore Flare	118	
WY	56005	EGU1324	4911	Black Hills Corporation_Simpson 2	707	✓
WY	56005	5600500002	4911	Black Hills Corporation Simpson 1	1,084	✓
WY	56005	EGU1323	4911	Pacificorp_Wyodak	8,291	✓
WY	56007	5600700001	2911	Sinclair Oil Corp-Sinclair Refinery	3,455	✓
WY	56009	EGU1325	4911	Pacificorp_Dave Johnston	19,978	✓
WY	56011	5601100002	1459	American Colloid_East Colony	133	✓

Table 6-1. Cont.

Tribe or State	County FIPS	Tribal or State Facility/ 2002 EI Identifier	Plant SIC	Facility Name	2002 SO_2 Emissions (Tons)	In 2003 SO_2 Milestone Report (A-1)
WY	56013	00011	1311	Santa Fe Snyder_Riverton Plant	193	
WY	56013	5601300028	1311	Burlington Resources_Lost Cabin	2,174	✓
WY	56015	5601500001	2063	Western Sugar Coop_Torrington Plant	160	✓
WY	56017	00009		Hallwood Petroleum-Feder Packsaddle 1-24	141	
WY	56017	00006	1311	Kcs Mountain Resrcs_Golden Eagle Flare	360	
WY	56017	00008		Hallwood Petroleum-Federal Packsaddle #1	971	
WY	56021	5602100001	2911	Frontier Refining, Inc.	1,494	✓
WY	56023	5602300013	1311	Exxon Shute Creek I	1,818	✓
WY	56023	EGU1326	4911	Pacificorp_Naughton Power Plant	19,310	✓
WY	56025	5602500005	2911	Sinclair Refinery - Casper	1,081	✓
WY	56029	00003		Celotex Corp.	299	
WY	56029	5602900007	1321	Marathon Oil Co _ Oregon Basin Gas Plant	300	✓
WY	56029	5602900012	1311	Howell Pet Corp_Elk Basin Gas Plant	1,465	✓
WY	56031	EGU1327	4911	Basin Electric_Laramie River Station	11,134	✓
WY	56035	00001		Exxon -Labarge Dehydration Facility	115	
WY	56037	5603700008	1321	Union Pac_Brady	144	✓
WY	56037	5603700003	5171	P4 Production_Rock Springs Facility	859	✓
WY	56037	5603700022	4911	Sf Phosphates, Inc	2,015	✓
WY	56037	5603700002	4911	General Chemical	4,965	✓
WY	56037	5603700048	2812	Fmc Corp_Green River Plant_Sodium Prod	5,258	✓
WY	56037	EGU1330	4911	Pacificorp_Jim Bridger	20,087	✓
WY	56041	5604100009	1311	Chevron Carter Creek	686	✓
WY	56041	5604100012	1311	Bp America - Whitney Canyon	6,291	✓
WY	56043	5604300003	1321	Hiland Partners, Llc_Hiland Gas Plant	264	✓
WY	56045	5604500001	2911	Wyoming Refining Co_Newcastle Refinery	343	✓
WY	56045	5604500005	4911	Black Hills Corporation _Osage	2,822	✓

Table 6-2. WRAP Facilities Shown in Appendix A-1 of 2003 SO_2 Milestone Report, and with 2002 SO_2 Emissions Less than 100 Tons

State	County FIPS	State Facility Identifier	Facility Name	2002 SO_2 Emissions (Tons)	Comment
AZ	041	11582	BHP San Manuel Smelter	0	Retired after 2002
AZ	003	2148	Douglas Lime Plant	0	Temporary shutdown in 2002
NM	001	145	City of Albuquerque – Southside Water Reclamation Plant	11	
NM	017	0001	Phelps Dodge – Hidalgo		Not in 2002 inventory
NM	023	0003	Phelps Dodge – Chino		Not in 2002 inventory
NM	015	0138	Magnum/Pan Energy – Burton Flats	0	
NM	025	0051	Dynegy Midstream Services, Eunice South Gas Plant (old name: Warren Petroleum, Eunice Gas Plant)	<1	
NM	015	0002	BP America Production, Empire Abo Plant (old name: Arco Permian Empire Abo Plant	0	
OR	065	0001	Northwest Aluminum Company, Inc.		Not in 2002 emissions inventory
OR	005	2145	West Linn Paper Company	<3	
WY	011	0003	American Colloid Mineral Company	48	
WY	037	0014	Anadarko E&P Company LP – Table Rock Gas Plant	29	
WY	023	0001	Astaris Production – Coking Plant	0	Retired after 2002
WY	003	0012	Big Horn Gas Processing, LLC – Big Horn/Byron Gas Plant	0	
WY	005	0146	Black Hills Corporation, Wygen 1	0	
WY			American Production Company – Whitney Canyon Gas Field		Not in 2002 emissions inventory
WY			Burlington Resources – Bighorn Wells	0	Came on-line after 2002; 2018 base case = 3,284 tons SO_2
WY			Chevron USA – Table Rock Field	0	Came on-line after 2002; 2018 base case = 232 tons SO_2
WY	013	5601300008	Devon Energy Corp – Beaver Creek Gas Plant	40	
WY			ExxonMobil Corporation – Black Canyon Dehydration Facility		Came on-line after 2002; 2018 base case = 240 tons SO_2
WY	037	5603700039	FMC Wyoming Corporation – Soda Ash Plant	10	
WY	037	5603700005	Solvay Minerals – Soda Ash Plant	33	

6.3 Data Formatting

Subsequent to development of the final 2018 base case inventory, the results were compiled using IDA format and submitted to the WRAP Regional Modeling Center (RMC) for use in modeling the "base18a" scenario. Also, the final 2018 base case inventory placed into NIF3.0 format and submitted to the WRAP for uploading to the EDMS. The inventory will be accessible through the EDMS at www.wrapedms.org.

7.0 2018 BASE CASE INVENTORY RESULTS

The 2018 base case inventory is summarized in Tables 7-1 through 7-6. Table 7-1 presents the overall 2002 and 2018 WRAP point source inventories at the tribal- and state-level, while Table 7-2 disaggregates the WRAP and CENRAP point source inventories into significant sectors (e.g., coal-fired EGUs, copper smelters, cement and lime kilns, etc.). The overall 2002 and 2018 WRAP area source inventories are summarized in Table 7-3. The disaggregated area source inventories for NO_x, SO_2, and PM_{10} are presented in Tables 7-4 through 7-6 for WRAP and CENRAP, although, CENRAP 2018 non-EGU point sources and all area sources are not yet available.

The inventories are also represented in bar charts in Figures 7-1 through 7-4 (for NO_x, SO_2, VOC, and PM_{10}, respectively). Although similar information is presented in the tables and bar charts, some significant findings and trends can be readily identified through examination of the bar charts. These findings include the following:

- The distribution of emissions between point and area sources varies by pollutant. Both VOC and PM_{10} are predominantly from area sources, while SO_2 is mainly from point sources. NO_x is similar to SO_2; however, the area source contribution is larger. In fact, area source NO_x exceeds point source NO_x in California, Idaho, and New Mexico.
- For most (but not all) states and pollutants there is moderate growth (i.e., less than 20 percent). This is primarily driven by population and/or economic growth as expressed by growth factors from EGAS, as well as increased demands for electricity generation.
- Significant decreases in emissions (e.g., point source SO_2 emissions in Colorado and Nevada) are the result of consent decrees or permit limits.
- Large increases in area source NO_x and VOC emissions (i.e., near doubling or greater in New Mexico and Wyoming) are primarily caused by significant projected increases in oil and gas production activity.

Appendix A contains additional 2018 base case inventory (Version 1) summaries, including "itemization" of the changes expected to occur in the point and area source inventories between 2002 and 2018 (e.g., tonnage change due to growth, tonnage change due to retirements/replacements, etc.).

Table 7-1. 2002 and 2018 Base Case – Point Source Emissions by State and Tribe, Version 1

State	State FIPS	2002 Emissions (tpy)							2018 Emissions (tpy)						
		NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3
Alaska	02	74,471	6,811	5,688	27,910	5,933	1,237	578	67,959	7,777	6,633	25,876	2,879	355	1,104
Arizona	04	64,084	93,756	5,464	15,232	9,533	1,059	531	77,737	106,113	9,459	33,242	9,889	1,638	728
California	06	104,435	42,120	54,160	120,089	29,946	20,276	433	109,515	49,632	54,632	123,795	33,192	19,497	
Colorado	08	117,869	97,011	91,750	35,951	21,125	29	539	112,153	68,476	98,630	58,211	28,697	307	623
Idaho	16	11,486	17,597	2,113	23,981	1,085	443	1,074	13,946	10,813	3,059	38,019	1,736	642	1,650
Montana	30	53,415	36,879	7,577	33,199	8,127	309	318	62,583	43,055	10,446	62,354	11,266	692	422
Nevada	32	59,737	50,720	2,213	11,083	4,738	1,075	629	69,016	24,041	4,113	20,746	6,200	1,535	1,173
New Mexico	35	100,352	37,436	17,574	36,589	3,826	2,678	75	74,874	40,825	26,187	57,506	3,392	1,749	123
North Dakota	38	87,425	156,668	2,086	11,944	3,277	2,712	518	91,895	162,705	2,494	22,373	4,369	3,052	523
Oregon	41	24,959	17,587	27,846	35,494	10,442	8,885	948	31,761	21,687	41,344	53,656	13,515	16,660	1,016
South Dakota	46	20,697	14,022	2,542	4,700	974	246	100	24,726	15,268	3,522	6,852	1,044	257	102
Utah	49	91,044	42,838	7,482	51,572	12,904	4,473	1,937	96,974	52,953	13,600	98,373	18,382	5,812	2,082
Washington	53	43,631	52,969	18,616	114,317	9,910	3,642	3,863	49,397	51,355	28,013	187,705	12,096	4,676	5,495
Wyoming	56	117,883	119,645	19,663	36,361	31,731	13,653	685	132,591	145,100	28,087	60,997	42,819	19,496	811
Tribes (Total)	00	87,215	38,208	1,710	6,297	6,342	3,006	125	92,580	32,895	2,864	12,988	7,749	3,206	125
Total		**1,058,702**	**824,265**	**266,484**	**564,719**	**159,892**	**63,723**	**12,352**	**1,107,708**	**832,693**	**333,083**	**862,693**	**197,226**	**79,572**	**15,977**

Tribe	Tribal FIPS	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3
Arapahoe Tribe of the Wind River Reservation, Wyoming	281	54	939	60		11			44	1,511	158		17		
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana	206	151	1	25	104	42			90	1	31	121	55		
Cabazon Band of Cahuilla Mission Indians of the Cabazon Reservation, California	568	190	52	11	4	9			268	73	15	6	13		
Coeur d'Alene Tribe of the Coeur d'Alene Reservation, Idaho	181	323	12	289	569	1,127			363	15	378	690	1,518		
Confederated Tribes and Bands of the Yakama Nation, Washington	124	60	16	120	95	96			64	15	191	144	123		

Table 7-1. Cont.

Tribe	Tribal FIPS	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3
Confederated Tribes of the Colville Reservation, Washington	101	227	22	58	570	308			245	34	87	867	306		
Confederated Tribes of the Umatilla Reservation, Oregon	143					6	1						7	1	
Fort Mojave Indian Tribe of Arizona, California & Nevada	604					13			225	12	271		116		
Gila River Indian Community of the Gila River Indian Reservation, Arizona	614	65	15	124	69	181			86	17	180	92	255		
La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation, California	577	1	0	0	0	5			2	0	0	1	6		
Navajo Nation, Arizona, New Mexico & Utah	780	83,387	37,028	915	4,621	4,115	2,929	125	88,234	31,108	1,422	10,767	4,771	3,104	125
Pueblo of Laguna, New Mexico	707	1,439	0	10					2,038	0	13				
Pueblo of Santa Ana, New Mexico	715	209	53	49	64	54			209	53	49	64	64		
Salt River Pima-Maricopa Indian Community of the Salt River Reservation, Arizona	615	212	64	29	95	284	69		180	50	41	83	382	92	
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	180	855	1	20	106	2			484	2	29	155	2		
Tohono O'Odham Nation of Arizona	610	42	3			68			48	3			82		
Ute Mountain Tribe of the Ute Mountain Reservation, Colorado, New Mexico & Utah	751					23	7						32	10	
Total		**87,215**	**38,208**	**1,710**	**6,297**	**6,342**	**3,006**	**125**	**92,580**	**32,895**	**2,864**	**12,988**	**7,749**	**3,206**	**125**

Table 7-2. 2002 and 2018 Base Case – Point Source Emissions by Sector, Version 1

State	2002 Emissions (tpy)						2018 Emissions (tpy)					
	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3
WRAP Point Sources Total	**1,058,743**	**824,260**	**266,469**	**159,905**	**63,741**	**12,352**	**1,107,708**	**832,693**	**333,083**	**197,226**	**79,572**	**15,977**
Coal-fired EGUs Total	574,643	581,397	3,988	32,064	14,760	2,884	615,081	543,078	5,259	40,594	17,598	2,949
Arizona	45,401	66,642	193	1,129	96	172	49,491	60,013	352	2,385	470	187
California	397	342	3	19	7		431	395	0	18	8	
Colorado	72,513	89,157	450	2,455	0	299	71,406	59,919	609	3,701	306	305
Idaho	0	0	0	0	0		1,675	1,675	41	335	87	
Montana	35,644	21,846	331	632	0	11	44,105	26,860	499	1,676	247	13
Nevada	38,872	49,198	186	2,657	426	127	39,823	21,912	244	3,126	548	139
New Mexico	33,997	18,233	184	1,769	399	5	25,392	17,170	229	889	494	5
North Dakota	75,950	140,534	781	2,911	2,349	378	82,738	152,827	909	3,958	2,645	383
Oregon	8,401	12,262	62	695	2	31	9,444	14,935	73	818	2	37
South Dakota	14,954	11,756	108	234	234	50	15,323	12,859	112	243	243	52
Utah	71,388	32,130	306	3,689	1,645	1,303	74,732	41,369	489	5,177	2,033	1,303
Washington	15,463	19,032					14,499	6,378				
Wyoming	84,518	83,411	852	11,774	6,673	382	102,849	96,050	1,031	13,499	7,411	400
Tribes	77,146	36,854	533	4,100	2,929	125	83,174	30,716	669	4,770	3,104	125
Other EGUs Total	**66,689**	**19,811**	**10,671**	**10,510**	**4,933**	**1,295**	**97,977**	**22,464**	**16,585**	**10,408**	**3,950**	**2,146**
Alaska	11,077	3,339	153	814	2		13,061	5,298	186	583	0	
Arizona	5,819	1,680	344	1,053	378	288	12,627	1,288	624	1,190	331	455
California	16,369	1,029	1,601	3,072	3,003	88	20,288	1,327	2,472	1,939	1,622	
Colorado	4,327	96	553	821	29	154	6,268	162	765	301	1	232
Idaho	19	0	0	2			312	7	0	0		
Montana	395	1,550	24	115		0	591	2,177	38	143		0
Nevada	13,070	108	449	712	117	342	18,053	212	1,368	1,203	221	872
New Mexico	3,075	46	148	186	70	7	6,139	66	294	456	132	40
North Dakota						31						31
Oregon	497	23	44	122	37	130	4,893	65	293	359	318	183
South Dakota	967	786	4	37			2,329	663	5	30		
Utah	1,891	1,138	122	172	90	40	2,332	807	170	235	79	48
Washington	5,721	2,791	2,121	2,274	1,207	178	7,389	3,569	3,082	2,320	1,246	212

Table 7-2. Cont.

State	2002 Emissions (tpy)						2018 Emissions (tpy)					
	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3
Wyoming	3,243	7,171	5,098	1,108		36	3,164	6,733	7,002	1,499		73
Tribes	218	56	12	23			532	91	288	148		
Copper Smelters Total	**538**	**25,044**	**205**	**832**	**155**	**0**	**818**	**44,191**	**293**	**876**	**292**	**0**
Arizona	377	24,105	195	639		0	555	42,501	277	511		0
Utah	161	939	10	194	155	0	264	1,690	16	365	292	0
Cement and Lime Kilns Total	**56,061**	**8,489**	**1,192**	**8,190**	**1,884**	**31**	**74,719**	**12,281**	**1,753**	**13,892**	**3,815**	**48**
Arizona	6,533	987	38	1,410			7,969	1,788	66	1,873		
California	20,555	3,292	248	3,498	1,388	0	25,618	4,156	284	7,008	3,043	
Colorado	3,844	670	208	958			5,454	1,098	347	1,460		
Idaho	672	40	7			6	973	45	12			11
Montana	3,570	601	9	509	0	1	4,631	746	13	755	1	2
Nevada	4,547	426	144				6,321	560	192			
New Mexico	804	15	37	97			1,055	25	60	148		
Oregon	1,741	38	15	64			2,290	63	25	104		
South Dakota	3,846	760	108	270			6,083	1,230	172	451		
Utah	3,965	374	326	835	367	24	6,066	567	507	1,287	577	36
Washington	3,747	1,068	0	280	128	0	5,519	1,672	0	415	194	0
Wyoming	2,232	210	46	232			2,733	319	70	341		
Tribes	6	9	4	38			7	11	5	49		
Oil & Gas Refining and Distribution Total	**38,522**	**65,051**	**23,248**	**4,250**	**2,007**	**357**	**39,257**	**66,348**	**28,801**	**3,197**	**931**	**438**
Alaska	2,256	518	864	169	33	16	2,304	490	1,131	137	38	16
Arizona	1,559	1	39	24	10	10	1,564	1	60	15	1	16
California	14,077	22,305	8,070	1,675	1,599		12,328	25,407	9,022	784	702	
Colorado	1,047	2,584	822	304		1	1,207	2,597	1,142	353		1
Montana	2,644	8,827	3,408	461	1	41	2,871	7,335	4,481	499	0	58
Nevada	82	93	62				112	123	81			
New Mexico	1,572	3,645	2,777	276	194	4	1,522	2,898	3,775	237	144	6
North Dakota	4,345	10,245	356			0	4,135	4,109	453			0
Oregon	805	4	25	9	1		795	4	24	0	2	
South Dakota	0	0	0	0			0	0	0	0		

Table 7-2. Cont.

State	2002 Emissions (tpy)						2018 Emissions (tpy)					
	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3
Utah	1,947	2,781	1,342	300	156	272	2,005	2,975	1,765	206	42	325
Washington	4,647	7,674	1,501	413	14	2	5,494	7,330	1,915	254	3	2
Wyoming	1,753	6,374	3,972	617	0	11	2,325	13,079	4,938	712	0	14
Tribes	1,789	0	10	1			2,595	0	15	0		
Oil & Gas Production Total	**188,134**	**36,133**	**93,808**	**5,053**	**4,007**	**133**	**131,645**	**48,431**	**100,811**	**777**	**386**	**244**
Alaska	45,822	826	2,310	2,253	822	21	36,501	122	2,112	358	39	87
Arizona	2,735	3	233	48			3,468	10	345	11		
California	16,707	2,556	7,101	1,698	1,699	7	13,390	1,988	4,962	170	152	
Colorado	25,955	93	63,960	401			15,832	131	59,436	43		
Idaho	2,590	7	78				1,734	10	114			
Montana	4,275	11	687	22	0		2,554	16	1,024	3	2	
Nevada	83	0	23	0			139	5	32	2		
New Mexico	57,173	14,156	11,527	330	1,382	32	36,323	19,226	18,339	114	146	44
North Dakota	4,739	2,949	187	7	7	1	2,946	3,354	262	1	0	2
Oregon	1,182	8	40	15	0		608	4	23	0	0	
South Dakota	323	10	26	128			311	15	38	9		
Utah	3,311	1,457	852	22	24	73	2,314	2,125	3,028	17	25	112
Washington	1,281	19	64	72	54		703	11	36	2	1	
Wyoming	15,015	13,822	6,283	27	18	0	9,713	20,902	10,155	22	21	0
Tribes	6,943	217	437	30			5,109	512	904	25		
All Other Point Sources Total	**134,156**	**88,334**	**133,357**	**99,006**	**35,996**	**7,651**	**148,210**	**95,900**	**179,581**	**127,483**	**52,601**	**10,152**
Alaska	15,317	2,127	2,360	2,697	379	542	16,093	1,867	3,203	1,803	278	1,001
Arizona	1,661	334	4,410	5,226	570	59	2,064	512	7,737	3,904	835	70
California	36,330	12,597	37,136	19,984	12,580	339	37,460	16,360	37,892	23,273	13,970	
Colorado	10,182	4,411	25,758	16,186		85	11,985	4,570	36,332	22,839		85
Idaho	8,206	17,550	2,027	1,085	442	1,068	9,252	9,076	2,891	1,401	554	1,640
Montana	6,887	4,044	3,118	6,388	307	265	7,831	5,921	4,392	8,189	443	350
Nevada	3,121	896	1,350	1,395	558	160	4,569	1,227	2,195	1,870	766	162
New Mexico	3,730	1,342	2,900	1,169	633	27	4,442	1,440	3,490	1,548	834	28
North Dakota	2,392	2,939	763	359	356	107	2,076	2,416	869	411	406	107

Table 7-2. Cont.

State	2002 Emissions (tpy)						2018 Emissions (tpy)					
	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	PM_{10}-PRI	PM_{25}-PRI	NH_3
Oregon	12,333	5,252	27,659	9,537	8,845	787	13,732	6,616	40,907	12,233	16,338	797
South Dakota	607	709	2,297	305	13	50	680	501	3,196	311	14	50
Utah	8,382	4,019	4,526	7,692	2,036	224	9,262	3,420	7,624	11,095	2,765	258
Washington	12,773	22,386	14,930	6,873	2,239	3,683	15,794	32,395	22,980	9,104	3,232	5,281
Wyoming	11,122	8,658	3,411	17,973	6,962	255	11,808	8,016	4,891	26,747	12,064	323
Tribes	1,113	1,071	714	2,137	77		1,163	1,565	982	2,757	102	
CENRAP Point Sources Total	**1,826,695**	**2,225,082**	**532,620**	**376,018**	**233,158**	**194,467**	**597,336**	**1,279,135**	**11,623**	**99,843**	**84,528**	**11,901**
CENRAP EGUs Total	**973,128**	**1,553,010**	**17,409**	**84,529**	**55,227**	**4,404**	**597,336**	**1,279,135**	**11,623**	**99,843**	**84,528**	**11,901**
Arkansas	39,303	70,367	476	1,173	586	1	33,097	82,605	696	3,897	3,326	814
Iowa	83,563	133,641	803	12,959	5,913		51,119	147,305	770	10,033	8,615	569
Kansas	94,665	129,720	1,087	15,475	13,696	4,166	83,333	81,486	798	8,520	6,807	461
Louisiana	116,018	108,657	3,089	10,441	7,943	28	30,432	74,262	660	3,966	3,590	919
Minnesota	91,497	105,826	728	10,122	6,301	59	41,029	85,847	674	8,162	7,035	343
Missouri	144,674	259,663	1,518	4,745	2,845	46	77,660	280,887	1,579	18,456	16,769	799
Nebraska	47,225	67,592	638	332	195	44	50,781	73,629	450	2,296	1,915	217
Oklahoma	86,222	110,837	988	4,365	2,639	61	76,048	113,680	1,008	5,561	4,840	1,355
Texas	269,961	566,708	8,082	24,918	15,109		153,837	339,433	4,987	38,952	31,631	6,423
CENRAP Other Point Sources Total	**853,567**	**672,072**	**515,211**	**291,488**	**177,931**	**190,063**						
Arkansas	29,564	20,401	102,032	38,811	30,881	2,910						
Iowa	38,561	51,024	38,353	15,829	7,737	3,366						
Kansas	70,620	10,651	26,371	31,606	11,376	59,749						
Louisiana	196,616	177,393	85,936	62,892	52,956	9,209						
Minnesota	63,645	25,716	40,242	40,989	21,236	28,614						
Missouri	37,125	101,885	34,626	16,204	8,235	31,074						
Nebraska	11,394	5,895	6,636	12,773	4,443	30,687						
Oklahoma	72,749	38,015	35,998	13,644	7,137	24,196						
Texas	332,396	241,090	144,993	58,611	33,833	255						
Tribes	898	0	22	129	96	4						

Table 7-3. 2002 and 2018 Base Case – Area Source Emissions by State and Tribe, Version 1

State	State FIPS	2002 Emissions (tpy)							2018 Emissions (tpy)						
		NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3
Alaska	02	8,488	5,531	13,020	27,258	15,042	5,474	472	9,293	6,044	16,539	29,056	21,531	6,878	639
Arizona	04	9,049	2,677	108,332	49,957	99,963	28,290	5,922	12,559	3,410	171,415	70,097	137,883	39,333	9,457
California	06	114,471	8,314	343,778	374,891	179,932	85,948	7,510	117,717	9,772	357,746	384,967	190,987	152,778	
Colorado	08	34,846	6,559	124,578	87,628	157,875	42,612	77	44,041	7,499	173,092	94,595	185,238	48,423	97
Idaho	16	30,318	2,916	123,944	34,271	50,992	5,729	1,684	42,068	2,721	194,210	40,971	62,881	7,703	2,288
Montana	30	12,072	3,299	55,104	36,903	153,207	35,456	460	36,053	3,432	67,477	41,415	173,892	40,015	608
Nevada	32	5,787	12,954	29,977	13,737	68,009	16,074	1,120	7,488	14,194	47,610	17,479	97,756	23,313	1,646
New Mexico	35	85,576	6,559	219,124	37,284	109,381	26,626	636	172,319	15,753	399,205	47,997	144,289	34,664	910
North Dakota	38	15,457	5,748	69,795	21,970	287,622	60,308	368	21,129	5,856	82,651	21,607	311,273	64,978	463
Oregon	41	14,825	9,932	251,802	352,955	177,460	69,096	227	17,027	8,422	334,872	380,524	225,925	81,745	250
South Dakota	46	6,345	10,167	42,661	24,249	209,041	45,029	381	7,207	11,667	50,072	25,112	226,750	48,648	502
Utah	49	11,335	3,581	85,320	42,929	30,256	4,975	1,320	21,636	3,587	173,344	45,962	34,279	5,761	1,680
Washington	53	18,355	7,388	198,283	222,555	283,542	93,472	4,471	22,746	8,667	253,710	252,447	348,329	113,985	7,022
Wyoming	56	34,891	17,902	140,248	29,292	37,511	10,804	389	79,196	23,109	436,885	34,463	45,027	12,436	514
Tribes (Total)	00	2,932	49	8,472	283	1,978	398	0	6,639	2	18,240	564	2,062	412	0
Total		**404,749**	**103,577**	**1,814,439**	**1,356,163**	**1,861,810**	**530,289**	**25,034**	**617,116**	**124,136**	**2,777,068**	**1,487,257**	**2,208,103**	**681,071**	**26,075**
Tribe	**Tribal FIPs**	**NO_X**	**SO_2**	**VOC**	**CO**	**PM_{10}-PRI**	**PM_{25}-PRI**	**NH_3**	**NO_X**	**SO_2**	**VOC**	**CO**	**PM_{10}-PRI**	**PM_{25}-PRI**	**NH_3**
Arapahoe Tribe of the Wind River Reservation, Wyoming	281	1,169	46	3,961	49				2,963	0	10,436	137			
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana	206	57	1	1,374	118	1,976	398	0	80	2	2,108	141	2,060	412	0
Cortina Indian Rancheria of Wintun Indians of California	513	0	0	0	2	2			0	0	1	2	2		

Table 7-3. Cont.

Tribe	Tribal FIPS	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3	NO_X	SO_2	VOC	CO	PM_{10}-PRI	PM_{25}-PRI	NH_3
La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation, California	577	0	0	0	0	0	0		0	0	0	0	0	0	
Navajo Nation, Arizona, New Mexico & Utah	780	1,167	2	2,344	101				2,810	0	4,540	265			
Ute Mountain Tribe of the Ute Mountain Reservation, Colorado, New Mexico & Utah	751	540	0	793	13				785	0	1,156	18			
Total		**2,932**	**49**	**8,472**	**283**	**1,978**	**398**	**0**	**6,639**	**2**	**18,240**	**564**	**2,062**	**412**	**0**

Table 7-4. 2002 and 2018 Base Case – Area Source NO_x Emissions by Sector, Version 1

	2002 (tons)	2018 (tons)
WRAP Area Sources (all categories)	**404,718**	**617,116**
Commercial/Institutional Heating - Natural Gas	**26,871**	**31,624**
Alaska	760	948
Arizona	1,462	2,086
California	14,564	15,271
Colorado	1,893	2,700
Idaho	739	1,054
Montana	657	929
Nevada	483	683
New Mexico	613	874
North Dakota	522	569
Oregon	1,231	1,536
South Dakota	486	529
Utah	219	310
Washington	2,742	3,422
Wyoming	490	699
Tribes	9	13
Industrial Combustion - Bituminous Coal	**9,807**	**10,332**
Arizona	565	584
Idaho	1,631	1,683
Montana	530	567
Nevada	962	1,030
New Mexico	196	203
South Dakota	2,079	2,284
Utah	0	0
Washington	434	462
Wyoming	3,408	3,518
Industrial Combustion - Distillate Oil	**12,235**	**14,729**
Arizona	1,267	1,590
California	203	272
Colorado	1,371	1,720
Idaho	1,508	1,892
Montana	681	784
Nevada	1,037	1,193
New Mexico	412	518
North Dakota	1,440	1,531
Oregon	359	445
South Dakota	831	883
Washington	1,502	1,862
Wyoming	1,625	2,039

Table 7-4. Cont.

	2002 (tons)	2018 (tons)
Industrial Combustion - Natural Gas	**75,563**	**92,947**
Alaska	2,048	2,303
Arizona	301	374
California	33,875	42,249
Idaho	1,067	1,325
Montana	333	464
Nevada	621	863
New Mexico	16,821	20,894
North Dakota	6,908	8,232
Oregon	2,360	2,654
South Dakota	822	980
Washington	2,711	3,049
Wyoming	7,697	9,561
Oil and Gas Production	**133,252**	**293,624**
Alaska	886	568
California	8,071	7,695
Colorado	23,147	27,709
Montana	7,792	30,529
Nevada	62	72
New Mexico	60,446	138,551
North Dakota	4,631	8,678
Oregon	85	48
South Dakota	367	507
Utah	5,190	13,174
Wyoming	19,699	59,533
Tribes	2,875	6,559
Residential Heating - LPG	**4,373**	**5,000**
Alaska	32	41
Arizona	215	260
California	1,146	1,072
Colorado	549	666
Idaho	421	511
Montana	158	226
Nevada	124	177
New Mexico	340	412
North Dakota	301	307
Oregon	162	206
South Dakota	286	291
Utah	150	214
Washington	355	451

Table 7-4. Cont.

	2002 (tons)	2018 (tons)
Wyoming	107	130
Tribes	25	36
Residential Heating - Natural Gas	**45,564**	**54,424**
Alaska	751	902
Arizona	1,654	2,602
California	21,978	20,312
Colorado	5,419	8,528
Idaho	958	1,508
Montana	943	1,443
Nevada	1,499	2,293
New Mexico	1,688	2,657
North Dakota	515	572
Oregon	1,809	2,172
South Dakota	593	658
Utah	3,860	5,904
Washington	3,374	4,050
Wyoming	508	799
Tribes	15	23
Woodstoves and Fireplaces	**13,649**	**14,230**
Alaska	157	164
Arizona	183	191
California	3,761	3,938
Colorado	916	956
Idaho	170	177
Montana	273	290
Nevada	118	125
New Mexico	144	150
North Dakota	181	181
Oregon	4,293	4,470
South Dakota	213	213
Utah	150	159
Washington	2,851	2,968
Wyoming	238	248
Tribes	0	0
OTHER	**83,404**	**100,206**
Alaska	3,853	4,367
Arizona	3,402	4,872
California	30,872	26,906
Colorado	1,552	1,761
Idaho	23,824	33,917
Montana	704	821

Table 7-4. Cont.

	2002 (tons)	2018 (tons)
Nevada	880	1,051
New Mexico	4,886	8,060
North Dakota	959	1,060
Oregon	4,526	5,496
South Dakota	669	862
Utah	1,766	1,875
Washington	4,384	6,481
Wyoming	1,119	2,668
Tribes	7	9
CENRAP Area Sources	**672,142**	**0**
Arkansas	24,563	
Iowa	5,867	
Kansas	42,197	
Louisiana	97,974	
Minnesota	59,566	
Missouri	33,062	
Nebraska	14,720	
Oklahoma	115,134	
Texas	279,051	
Tribes	8	

Table 7-5. 2002 and 2018 Base Case – Area Source SO_2 Emissions by Sector, Version 1

	2002 (tons)	2018 (tons)
WRAP Area Sources (all categories)	**103,577**	**124,136**
Commercial/Institutional Heating - Bituminous Coal	**8,550**	**9,343**
Alaska	2,474	2,828
Arizona	2	3
Colorado	2,054	2,260
Idaho	106	116
Montana	30	30
Nevada	11	11
New Mexico	63	70
South Dakota	1	2
Utah	1,749	1,753
Washington	186	212
Wyoming	1,872	2,059
Commercial/Institutional Heating - Natural Gas	**138**	**159**
Alaska	5	6
Arizona	7	10
California	72	72
Colorado	5	7
Idaho	4	6
Montana	4	6
Nevada	5	7
New Mexico	4	5
North Dakota	3	3
Oregon	8	10
South Dakota	3	3
Utah	2	2
Washington	16	21
Wyoming	1	1
Tribes	0	0
Industrial Combustion - Bituminous Coal	**26,031**	**27,587**
Arizona	918	948
Idaho	1,746	1,803
Montana	1,095	1,173
Nevada	4,935	5,283
New Mexico	508	525
South Dakota	6,966	7,653
Utah	0	0
Washington	750	798
Wyoming	9,111	9,404

Table 7-5. Cont.

	2002 (tons)	2018 (tons)
Industrial Combustion - Distillate Oil	**26,956**	**31,953**
Arizona	1,117	1,402
California	249	346
Colorado	2,920	3,665
Idaho	90	113
Montana	1,450	1,670
Nevada	7,301	8,404
New Mexico	878	1,102
North Dakota	3,068	3,263
Oregon	1,453	1,800
South Dakota	1,769	1,881
Washington	3,200	3,965
Wyoming	3,461	4,343
Industrial Combustion - Residual Oil	**11,132**	**25,445**
Alaska	130	22
Arizona	55	248
California	2,555	3,486
Idaho	7	32
Nevada	396	145
New Mexico	2,913	13,106
North Dakota	254	444
Oregon	2,693	449
South Dakota	752	1,317
Wyoming	1,377	6,196
Oil and Gas Production	**3,828**	**110**
Alaska	66	1
California	57	52
Colorado	260	9
Montana	227	8
Nevada	1	0
New Mexico	1,444	17
North Dakota	358	3
South Dakota	8	0
Utah	147	5
Wyoming	1,213	16
Tribes	48	1
Residential Heating - LPG	**82**	**97**
Alaska	0	0
Arizona	1	2
California	61	71

Table 7-5. Cont.

	2002 (tons)	2018 (tons)
Colorado	4	5
Idaho	3	4
Montana	1	1
Nevada	1	1
New Mexico	2	3
North Dakota	2	2
Oregon	1	1
South Dakota	2	2
Utah	1	1
Washington	2	3
Wyoming	1	1
Tribes	0	0
Residential Heating - Natural Gas	**296**	**379**
Alaska	5	6
Arizona	11	17
California	145	162
Colorado	35	54
Idaho	6	10
Montana	6	9
Nevada	9	14
New Mexico	11	17
North Dakota	3	4
Oregon	12	14
South Dakota	4	4
Utah	25	38
Washington	22	26
Wyoming	4	6
Woodstoves and Fireplaces	**1,931**	**2,011**
Alaska	24	25
Arizona	28	29
California	550	574
Colorado	177	185
Idaho	26	27
Montana	42	44
Nevada	11	11
New Mexico	22	23
North Dakota	28	28
Oregon	616	642
South Dakota	33	33
Utah	23	24
Washington	332	346

Table 7-5. Cont.

	2002 (tons)	2018 (tons)
Wyoming	20	21
Tribes	0	0
OTHER	**24,633**	**27,051**
Alaska	2,828	3,156
Arizona	538	753
California	4,625	5,010
Colorado	1,104	1,314
Idaho	928	610
Montana	443	491
Nevada	286	319
New Mexico	714	886
North Dakota	2,031	2,110
Oregon	5,149	5,506
South Dakota	628	773
Utah	1,635	1,764
Washington	2,879	3,296
Wyoming	843	1,062
Tribes	1	1
CENRAP Area Sources	**321,088**	**0**
Arkansas	27,887	
Iowa	3,286	
Kansas	14,023	
Louisiana	83,292	
Minnesota	15,558	
Missouri	48,183	
Nebraska	7,744	
Oklahoma	11,731	
Texas	109,383	
Tribes	1	

Table 7-6. 2002 and 2018 Base Case – Area Source PM_{10} Emissions by Sector, Version 1

	2002 (tons)	2018 (tons)
WRAP Area Sources (all categories)	**1,861,810**	**2,208,103**
Agriculture Production - Crops	**812,343**	**838,372**
Arizona	17,088	16,383
California	36,186	35,489
Colorado	90,207	93,467
Idaho	15,429	15,986
Montana	89,485	92,718
Nevada	559	579
New Mexico	17,158	17,778
North Dakota	235,684	244,201
Oregon	32,379	33,549
South Dakota	156,837	162,505
Utah	20,626	21,372
Washington	95,762	99,222
Wyoming	3,034	3,144
Tribes	1,910	1,979
Commercial/Institutional Heating - Natural Gas	**2,139**	**152**
Alaska	58	5
Arizona	86	8
California	1,177	64
Colorado	224	22
Montana	50	5
Nevada	75	7
New Mexico	47	5
North Dakota	40	3
Oregon	99	8
South Dakota	37	3
Washington	208	18
Wyoming	37	4
Tribes	1	0
Construction	**669,647**	**922,721**
Alaska	5,326	9,425
Arizona	61,695	94,032
California	70,655	83,839
Colorado	52,168	75,817
Idaho	27,050	36,130
Montana	27,913	36,366
Nevada	52,443	78,925
New Mexico	76,802	105,599
North Dakota	20,571	24,855

Table 7-6. Cont.

	2002 (tons)	2018 (tons)
Oregon	93,264	133,182
South Dakota	10,984	14,020
Utah	6,478	9,130
Washington	140,333	192,604
Wyoming	23,964	28,795
Tribes	2	2
Food and Kindred Products	**23,256**	**26,603**
Alaska	228	325
Arizona	1,973	2,569
California	12,288	12,269
Colorado	1,843	2,202
Idaho	431	630
Montana	365	441
Nevada	109	136
New Mexico	619	771
North Dakota	180	219
Oregon	1,746	2,481
South Dakota	252	280
Utah	605	758
Washington	2,411	3,284
Wyoming	205	237
Mining and Quarrying	**146,311**	**191,970**
Alaska	3,644	5,466
Arizona	9,923	12,096
California	1,377	1,514
Montana	29,250	37,670
Nevada	12,142	14,691
New Mexico	8,745	12,284
North Dakota	27,683	38,588
Oregon	6,246	9,370
South Dakota	34,473	43,091
Washington	6,767	9,003
Wyoming	5,999	8,117
Tribes	62	80
Oil and Gas Production	**189**	**177**
California	189	177
Open Burning - Land Clearing Debris	**15,723**	**21,527**
Arizona	2,189	3,461
Montana	888	1,031
Nevada	215	363
New Mexico	1,159	1,496

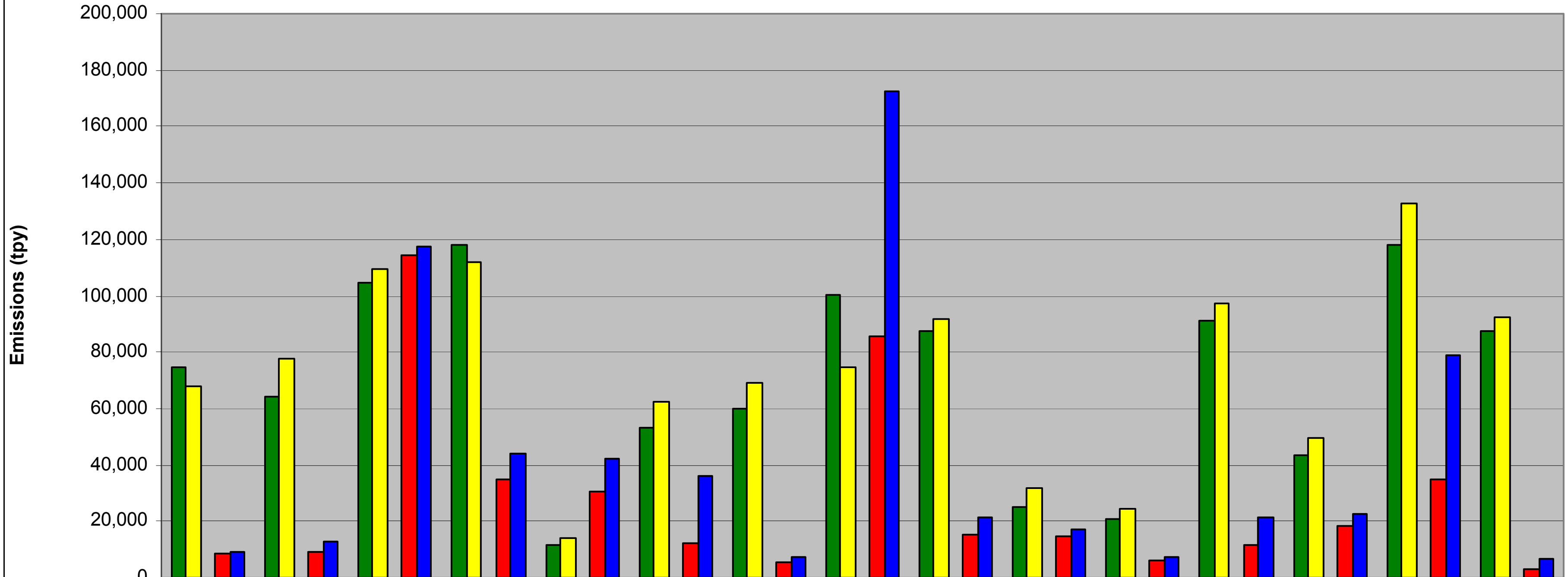
Table 7-6. Cont.

	2002 (tons)	2018 (tons)
North Dakota	37	39
Oregon	1,834	2,485
South Dakota	205	230
Washington	8,805	11,995
Wyoming	392	428
Open Burning - Residential Household Waste	**24,803**	**33,324**
Alaska	664	899
Arizona	2,773	4,385
Idaho	5,819	7,772
Montana	1,235	1,434
Nevada	367	620
New Mexico	1,936	2,498
North Dakota	884	948
Oregon	3,501	4,744
South Dakota	1,115	1,250
Utah	131	183
Washington	6,012	8,190
Wyoming	367	401
Residential Heating - Natural Gas	**3,216**	**275**
Alaska	61	5
Arizona	134	14
California	1,876	143
Colorado	438	47
Montana	76	8
Nevada	90	9
New Mexico	136	15
North Dakota	42	3
South Dakota	48	4
Washington	273	22
Wyoming	41	4
Tribes	1	0
Woodstoves and Fireplaces	**130,820**	**136,235**
Alaska	1,746	1,818
Arizona	2,097	2,188
California	41,298	43,069
Colorado	11,388	11,883
Idaho	2,263	2,362
Montana	3,025	3,206
Nevada	640	678
New Mexico	1,565	1,633
North Dakota	2,000	2,000

Table 7-6. Cont.

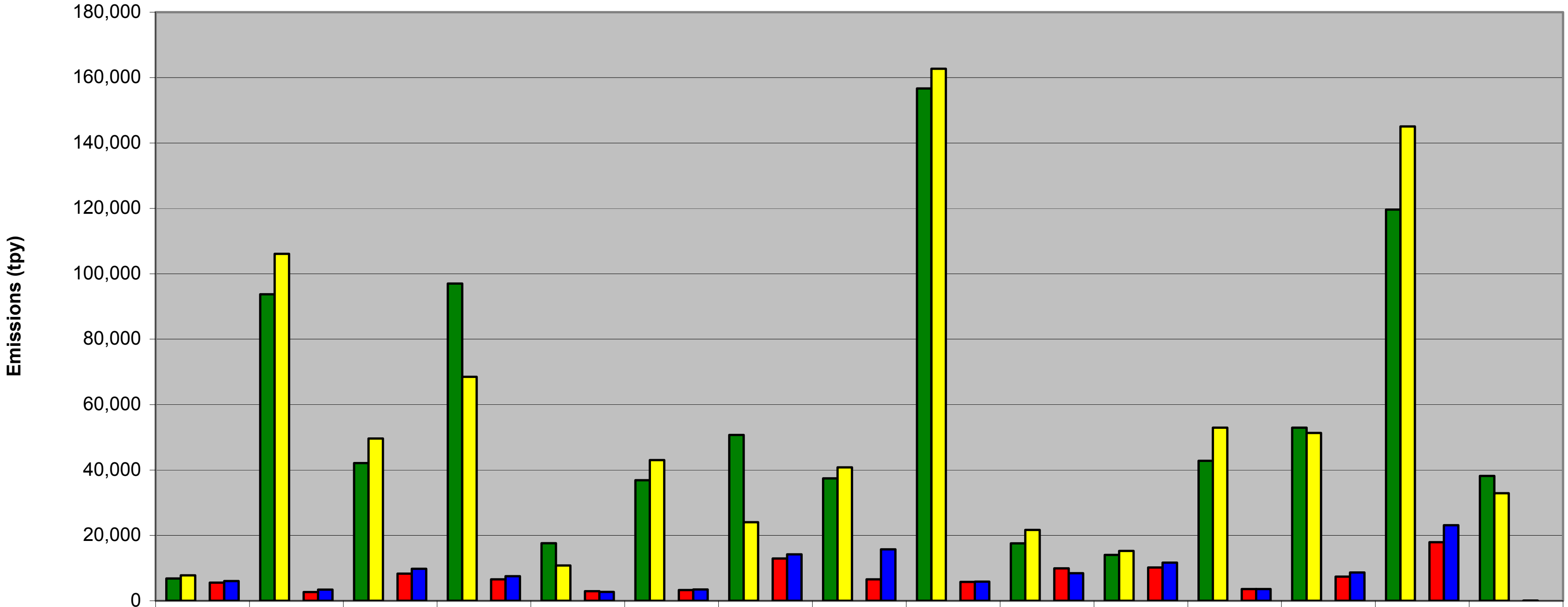
	2002 (tons)	2018 (tons)
Oregon	37,628	39,175
South Dakota	2,361	2,361
Utah	1,575	0
Washington	20,854	1,669
Wyoming	2,378	21,711
Tribes	0	2,482
OTHER	**33,364**	**36,746**
Alaska	3,316	3,590
Arizona	2,006	2,747
California	14,887	14,424
Colorado	1,606	1,799
Idaho	0	1
Montana	920	1,014
Nevada	1,369	1,747
New Mexico	1,214	2,211
North Dakota	502	415
Oregon	761	931
South Dakota	2,729	3,005
Utah	840	1,167
Washington	2,117	2,279
Wyoming	1,094	1,415
Tribes	2	0
CENRAP Area Sources	**1,849,378**	**0**
Arkansas	74,599	
Iowa	55,303	
Kansas	161,963	
Louisiana	95,076	
Minnesota	304,452	
Missouri	93,331	
Nebraska	36,332	
Oklahoma	121,772	
Texas	906,497	
Tribes	52	

Figure 7-1. WRAP Point and Area Source 2002 and 2018 NO_x Emissions, Version 1



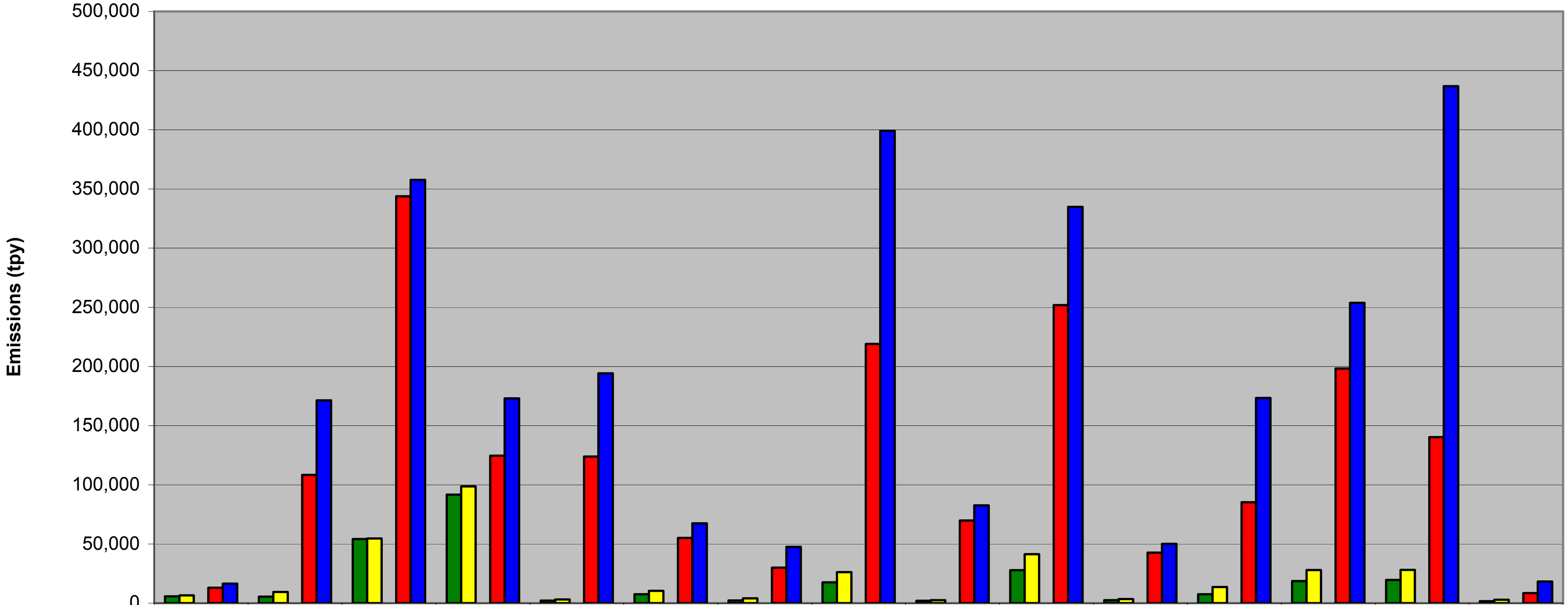
	AK	AZ	CA	CO	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	Tribes
2002-Point	74,472	64,084	104,435	117,869	11,487	53,415	59,775	100,352	87,425	24,959	20,698	91,044	43,631	117,883	87,215
2018-Point	67,959	77,737	109,515	112,153	13,946	62,583	69,016	74,874	91,895	31,761	24,726	96,974	49,397	132,591	92,580
2002-Area	8,488	9,049	114,471	34,846	30,318	12,072	5,787	85,576	15,457	14,825	6,345	11,335	18,355	34,891	2,932
2018-Area	9,293	12,559	117,717	44,041	42,068	36,053	7,488	172,319	21,129	17,027	7,207	21,636	22,746	79,196	6,639

Figure 7-2. WRAP Point and Area Source 2002 and 2018 SO_2 Emissions, Version 1



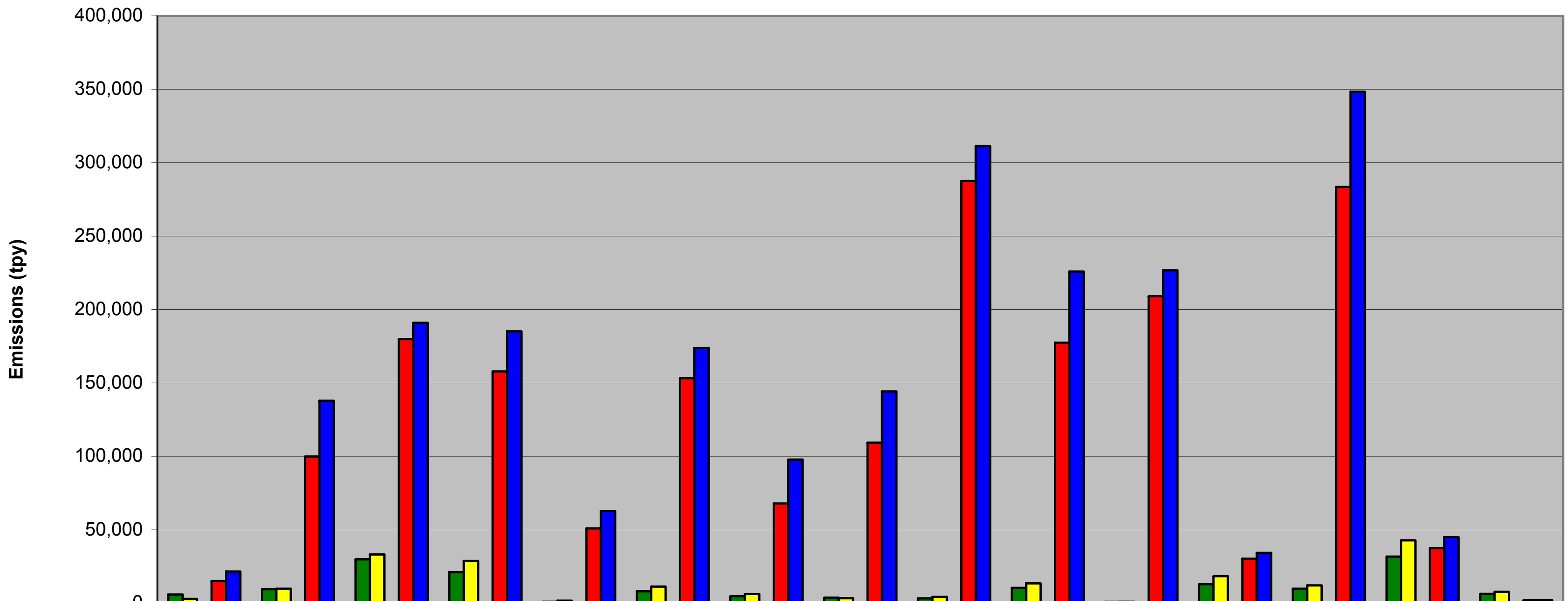
	AK	AZ	CA	CO	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	Tribes
2002-Point	6,809	93,752	42,120	97,011	17,597	36,879	50,722	37,436	156,668	17,587	14,021	42,838	52,969	119,645	38,208
2018-Point	7,777	106,113	49,632	68,476	10,813	43,055	24,041	40,825	162,705	21,687	15,268	52,953	51,355	145,100	32,895
2002-Area	5,531	2,677	8,314	6,559	2,916	3,299	12,954	6,559	5,748	9,932	10,167	3,581	7,388	17,902	49
2018-Area	6,044	3,410	9,772	7,499	2,721	3,432	14,194	15,753	5,856	8,422	11,667	3,587	8,667	23,109	2

Figure 7-3. WRAP Point and Area Source 2002 and 2018 VOC Emissions, Version 1



	AK	AZ	CA	CO	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	Tribes
2002-Point	5,686	5,451	54,160	91,750	2,113	7,577	2,213	17,574	2,086	27,845	2,542	7,482	18,616	19,663	1,710
2018-Point	6,633	9,459	54,632	98,630	3,059	10,446	4,113	26,187	2,494	41,344	3,522	13,600	28,013	28,087	2,864
2002-Area	13,020	108,332	343,778	124,578	123,944	55,104	29,977	219,124	69,795	251,802	42,661	85,320	198,283	140,248	8,472
2018-Area	16,539	171,415	357,746	173,092	194,210	67,477	47,610	399,205	82,651	334,872	50,072	173,344	253,710	436,885	18,240

Figure 7-4. WRAP Point and Area Source 2002 and 2018 PM_{10}-Primary Emissions, Version 1



	AK	AZ	CA	CO	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	Tribes
2002-Point	5,932	9,529	29,946	21,125	1,087	8,127	4,763	3,826	3,277	10,442	974	12,904	9,912	31,731	6,329
2018-Point	2,879	9,889	33,192	28,697	1,736	11,266	6,200	3,392	4,369	13,515	1,044	18,382	12,096	42,819	7,749
2002-Area	15,042	99,963	179,932	157,875	50,992	153,207	68,009	109,381	287,622	177,460	209,041	30,256	283,542	37,511	1,978
2018-Area	21,531	137,883	190,987	185,238	62,881	173,892	97,756	144,289	311,273	225,925	226,750	34,279	348,329	45,027	2,062

8.0 REFERENCES

Abt, 2004. *Economic Growth and Analysis System: Getting Started with EGAS 5.0 Beta*. Prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards by Abt Associates Inc., Bethesda, MD. October.

EIA, 2005. *Annual Energy Outlook 2005 With Projections to 2025*. DOE/EIA-0383(2005). Energy Information Administration, Washington, DC. February.

ENVIRON, 2005. *Oil and Gas Emission Inventories for the Western States*, Draft Report. Prepared for the Western Regional Air Partnership, Stationary Sources Joint Forum. Prepared by ENVIRON International Corporation, Novato, CA. December.

Huntley, 2005. Electronic file sent via electronic mail from Roy Huntley, U.S. Environmental Protection Agency, Research Triangle Park, NC. August 30.

Johnson and Lakhanpal, 1997. *Redesign of California's Emission Forecasting System (CEFS)*. Martin E. Johnson, California Air Resources Board, Sacramento, CA, and Dr. Bharat Lakhanpal, Institute for Economic and Environmental Studies, California State University, Fullerton. Paper presented at the Air and Waste Management Association Specialty Conference on Emission Inventories, Research Triangle Park, NC. October 28-30, 1997.

Pechan, 2001. *Development of Emission Growth Surrogates and Activity Projections Used in Forecasting Point and Area Source Emissions*. Final Report. Prepared for the California Air Resources Board, and the California Environmental Protection Agency, Planning and Technical Support Division, by E.H. Pechan & Associates, Durham, NC. February 26.

USDA, 2005. *USDA Agricultural Baseline Projections to 2014*. Baseline Report OCE-2005-1. U.S. Department of Agriculture, Office of the Chief Economist. February.

U.S. EPA, 1995. *Compilation of Air Pollution Emission Factors (AP-42)–Volume I: Stationary Point and Area Sources*, Fifth Edition (various sections). U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

U.S. EPA, 2004. EGAS Website. Internet address: http://www.epa.gov/ttn/ecas/egas5.htm. U.S. Environmental Protection Agency, Innovative Strategies and Economics Group.

U.S. EPA, 2005a. Clean Air Markets – Data and Maps Website. Internet address: http://cfpub.epa.gov/gdm/. U.S. Environmental Protection Agency, Clean Air Markets Division.

U.S. EPA, 2005b. National Coal-Fired Utility Projects. Internet address: http://www.epa.gov/ttu/cat/dir1/natcoal.xls. U.S. Environmental Protection Agency. May

WRAP, 2005. *2003 Regional SO_2 Emissions and Milestone Report.* Internet address: http://www.wrapair.org/forums/309/docs.html. Prepared by the Western Regional Air Partnership. April 21.

APPENDIX A

ADDITIONAL 2018 BASE CASE INVENTORY (VERSION 1) SUMMARIES

Table A-1. Itemization of Changes Projected to Point Source Emissions Between 2002 and 2018 (NO_x in tons), Version 1

State	2002 Emissions	Actual Post-2002 Adjustments	Actual Post-2002 Controls	Growth	Retirements/ Replacements	Growth (New/future)	Permit Limits	2018 Emissions
WRAP Point Sources Total NO_x	**1,058,743**	**1,489**	**-182**	**92,310**	**-87,950**	**53,585**	**-15,368**	**1,107,705**
Coal-fired EGUs Total	574,643	-1,897	-7	9,504	-737	44,297	-10,755	615,081
AK								
AZ	45,401	0	0	2,850	0	5,897	-4,657	49,491
CA	397							431
CO	72,513	-2,508	0	-1,617	-203	5,864	-2,643	71,406
ID	0	0	0	0	0	1,675	0	1,675
MT	35,644	0	0	3,835	-99	4,724	0	44,105
NV	38,872	0	0	2,060	0	2,345	-3,455	39,823
NM	33,997	0	-7	-10,243	-30	1,675	0	25,392
ND	75,950	0	0	1,762	0	5,026	0	82,738
OR	8,401	0	0	1,043	0	0	0	9,443
SD	14,954	0	0	369	0	0	0	15,323
UT	71,388	0	0	-4,094	0	7,439	0	74,732
WA	15,463	0	0	-964	0	0	0	14,499
WY	84,518	611	0	11,826	-406	6,299	0	102,849
Tribes	77,146	0	0	2,678	0	3,351	0	83,174
Other EGUs Total	66,689	4,237	0	19,643	-5,366	9,289	-434	97,977
AK	11,077	0	0	3,165	-748	0	-434	13,061
AZ	5,819	2,297	0	4,071	-1,406	1,845	0	12,627
CA	16,369							20,288
CO	4,327	392	0	2,333	-784	0	0	6,268
ID	19	91	0	209	-7	0	0	312
MT	395	4	0	198	-6	0	0	591
NV	13,070	728	0	2,081	-339	2,513	0	18,053
NM	3,075	102	0	2,725	-207	443	0	6,139
ND								
OR	497	172	0	337	-34	3,920	0	4,893
SD	967	72	0	1,483	-193	0	0	2,329
UT	1,891	7	0	540	-445	340	0	2,332
WA	5,721	126	0	2,042	-727	227	0	7,389

Table A-1. Cont.

State	2002 Emissions	Actual Post-2002 Adjustments	Actual Post-2002 Controls	Growth	Retirements/ Replacements	Growth (New/future)	Permit Limits	2018 Emissions
WY	3,243	45	0	347	-472	0	0	3,164
Tribes	218	200	0	114	0	0	0	532
All Other Point SourcesTotal	417,411	-851	-174	63,163	-81,846	0	-4,179	394,647
AK	63,394	0	0	11,185	-15,503	0	-4,179	54,898
AZ	12,864	-10	0	4,043	-1,276	0	0	15,619
CA	87,668							88,796
CO	41,029	0	0	6,697	-13,250	0	0	34,476
ID	11,468	0	0	2,648	-2,155	0	0	11,959
MT	17,376	10	0	3,268	-2,766	0	0	17,888
NV	7,833	66	0	3,302	-60	0	0	11,141
NM	63,280	-414	-174	6,321	-25,670	0	0	43,343
ND	11,475	-661	0	1,395	-3,051	0	0	9,157
OR	16,061	-63	0	3,866	-2,439	0	0	17,425
SD	4,777	0	0	2,477	-179	0	0	7,074
UT	17,765	0	0	4,811	-2,666	0	0	19,910
WA	22,448	72	0	6,483	-1,494	0	0	27,509
WY	30,122	148	0	4,649	-8,340	0	0	26,579
Tribes	9,851	0	0	2,019	-2,996	0	0	8,874

Table A-2. Itemization of Changes Projected to Point Source Emissions Between 2002 and 2018 (SO_2 in tons), Version 1

State	Section 309 Flag	2002 Emissions	Actual Post-2002 Adjustments	Actual Post-2002 Controls	Growth	Retirements/ Replacements	Growth (New/future)	Permit Limits	2018 Emissions
WRAP Point Sources Total SO_2		**824,262**	**3,225**	**-16,082**	**51,208**	**-18,950**	**44,356**	**-62,835**	**832,698**
Coal-fired EGUs Total		545,350	532	-29	-6,163	-1,477	44,297	-62,088	520,475
AK									
AZ	Section 309 Sources	66,642	0	0	-1,838	0	0	-10,688	54,116
AZ	Non-Section 309 Sources	0	0	0	0	0	5,897	0	5,897
CA	Section 309 Sources	342							395
CA	Non-Section 309 Sources								
CO	Section 309 Sources	53,891	0	0	-9,041	-328	0	-11,917	32,605
CO	Non-Section 309 Sources	0	0	0	0	0	5,864	0	5,864
ID	Section 309 Sources								
ID	Non-Section 309 Sources	0	0	0	0	0	1,675	0	1,675
MT		21,066	0	0	27	-110	4,724	0	25,707
NV	Section 309 Sources	49,198	0	0	9,851	0	0	-39,482	19,567
NV	Non-Section 309 Sources	0	0	0	0	0	2,345	0	2,345
NM	Section 309 Sources	18,233	0	-29	-2,664	-45	0	0	15,495
NM	Non-Section 309 Sources	0	0	0	0	0	1,675	0	1,675
ND		140,534	0	0	7,266	0	5,026	0	152,827
OR	Section 309 Sources	12,262	0	0	2,672	0	0	0	14,935
OR	Non-Section 309 Sources								
SD		11,756	0	0	1,103	0	0	0	12,859
UT	Section 309 Sources	32,130	0	0	1,801	0	0	0	33,930
UT	Non-Section 309 Sources	0	0	0	0	0	7,439	0	7,439
WA		19,032	0	0	-12,654	0	0	0	6,378

Table A-2. Cont.

State	Section 309 Flag	2002 Emissions	Actual Post-2002 Adjustments	Actual Post-2002 Controls	Growth	Retirements/ Replacements	Growth (New/future)	Permit Limits	2018 Emissions
WY	Section 309 Sources	83,411	0	0	6,752	-875	0	0	89,288
WY	Non-Section 309 Sources	0	532	0	50	-119	6,299	0	6,763
Tribes	Section 309 Sources	36,854	0	0	-9,489	0	0	0	27,365
Tribes	Non-Section 309 Sources	0	0	0	0	0	3,351	0	3,351
Other EGUs Total		55,858	-1,659	0	-6,067	-2,980	59	-442	45,068
AK		3,339	0	0	2,164	-181	0	-24	5,298
AZ	Section 309 Sources	1,634	0	0	15	-522	0	0	1,128
AZ	Non-Section 309 Sources	46	66	0	37	0	12	0	160
CA	Section 309 Sources								
CA	Non-Section 309 Sources	1,029							1,327
CO	Section 309 Sources	35,266	-1,819	0	-11,579	0	0	-418	21,451
CO	Non-Section 309 Sources	96	13	0	52	0	0	0	161
ID	Section 309 Sources								
ID	Non-Section 309 Sources	0	3	0	5	0	0	0	7
MT		2,331	0	0	999	0	0	0	3,330
NV	Section 309 Sources								
NV	Non-Section 309 Sources	108	44	0	45	-1	16	0	212
NM	Section 309 Sources	0	0	0	9	0	0	0	9
NM	Non-Section 309 Sources	46	3	0	13	-8	3	0	57
OR	Section 309 Sources								
OR	Non-Section 309 Sources	23	6	0	11	0	25	0	65
SD		786	4	0	48	-176	0	0	663
UT	Section 309 Sources	1,121	0	0	16	-359	0	0	778

Table A-2. Cont.

State	Section 309 Flag	2002 Emissions	Actual Post-2002 Adjustments	Actual Post-2002 Controls	Growth	Retirements/ Replacements	Growth (New/future)	Permit Limits	2018 Emissions
UT	Non-Section 309 Sources	17	0	0	10	0	2	0	29
WA		2,791	8	0	914	-145	1	0	3,569
WY	Section 309 Sources	7,171	0	0	1,149	-1,589	0	0	6,731
WY	Non-Section 309 Sources	0	2	0	0	0	0	0	2
Tribes	Section 309 Sources								
Tribes	Non-Section 309 Sources	56	11	0	24	0	0	0	91
All Other Point Sources Total SO_2		223,053	4,351	-16,053	63,439	-14,492	0	-306	267,155
AK		3,472	0	-766	558	-475	0	-306	2,484
AZ	Section 309 Sources	25,082	0	0	18,995	0	0	0	44,076
AZ	Non-Section 309 Sources	349	126	0	261	-2	0	0	736
CA	Section 309 Sources	37,565							44,809
CA	Non-Section 309 Sources	3,184							3,101
CO	Section 309 Sources	6,329	0	0	1,396	-1,292	0	0	6,433
CO	Non-Section 309 Sources	1,428	0	0	587	-53	0	0	1,963
ID	Section 309 Sources	17,302	0	-10,228	2,587	-891	0	0	8,771
ID	Non-Section 309 Sources	295	0	0	83	-18	0	0	359
MT		13,483	0	0	2,833	-2,297	0	0	14,018
NV	Section 309 Sources	1,009	0	0	371	0	0	0	1,380
NV	Non-Section 309 Sources	407	71	0	76	-17	0	0	536
NM	Section 309 Sources	18,152	0	-669	5,369	-624	0	0	22,228
NM	Non-Section 309 Sources	1,005	-16	0	375	-3	0	0	1,361
ND		16,134	-362	-4,390	1,621	-3,126	0	0	9,878

Table A-2. Cont.

State	Section 309 Flag	2002 Emissions	Actual Post-2002 Adjustments	Actual Post-2002 Controls	Growth	Retirements/ Replacements	Growth (New/future)	Permit Limits	2018 Emissions
OR	Section 309 Sources	4,784	0	0	1,556	-363	0	0	5,977
OR	Non-Section 309 Sources	517	1	0	199	-9	0	0	710
SD		1,480	0	0	505	-238	0	0	1,746
UT	Section 309 Sources	8,809	0	0	2,186	-1,242	0	0	9,754
UT	Non-Section 309 Sources	761	0	0	276	-14	0	0	1,023
WA		31,146	-73	0	12,359	-2,024	0	0	41,408
WY	Section 309 Sources	28,101	0	0	10,208	-1,743	0	0	36,567
WY	Non-Section 309 Sources	962	4,604	0	240	-57	0	0	5,749
Tribes	Section 309 Sources	1,015	0	0	638	0	0	0	1,654
Tribes	Non-Section 309 Sources	282	0	0	157	-4	0	0	435

Table A-3. Itemization of Changes Projected to Area Sources Emissions Between 2002 and 2018 (NO_x), Version 1

	2002 (tons)	Actual Post-2002 Adjustments	Control	Growth	2018 (tons)
WRAP Area Sources (All Categories)	**404,718**	**0**	**-29,785**	**238,937**	**617,116**
Commercial/Institutional Heating - Natural Gas	**26,871**	**0**	**0**	**4,047**	**31,624**
Alaska	760	0	0	188	948
Arizona	1,462	0	0	624	2,086
California	14,564				15,271
Colorado	1,893	0	0	807	2,700
Idaho	739	0	0	315	1,054
Montana	657	0	0	272	929
Nevada	483	0	0	200	683
New Mexico	613	0	0	261	874
North Dakota	522	0	0	47	569
Oregon	1,231	0	0	305	1,536
South Dakota	486	0	0	44	529
Utah	219	0	0	91	310
Washington	2,742	0	0	680	3,422
Wyoming	490	0	0	209	699
Tribes	9	0	0	4	13
Industrial Combustion - Bituminous Coal	**9,807**	**0**	**0**	**525**	**10,332**
Arizona	565	0	0	18	584
Idaho	1,631	0	0	53	1,683
Montana	530	0	0	37	567
Nevada	962	0	0	68	1,030
New Mexico	196	0	0	6	203
South Dakota	2,079	0	0	205	2,284
Utah	0	0	0	0	0
Washington	434	0	0	28	462
Wyoming	3,408	0	0	110	3,518
Industrial Combustion - Distillate Oil	**12,235**	**0**	**0**	**2,425**	**14,729**
Arizona	1,267	0	0	323	1,590
California	203				272
Colorado	1,371	0	0	349	1,720
Idaho	1,508	0	0	384	1,892
Montana	681	0	0	103	784
Nevada	1,037	0	0	157	1,193
New Mexico	412	0	0	105	518
North Dakota	1,440	0	0	91	1,531
Oregon	359	0	0	86	445

Table A-3. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Control	Growth	2018 (tons)
South Dakota	831	0	0	53	883
Washington	1,502	0	0	359	1,862
Wyoming	1,625	0	0	414	2,039
Industrial Combustion - Natural Gas	**75,563**	**0**	**0**	**9,010**	**92,947**
Alaska	2,048	0	0	255	2,303
Arizona	301	0	0	73	374
California	33,875				42,249
Idaho	1,067	0	0	258	1,325
Montana	333	0	0	130	464
Nevada	621	0	0	242	863
New Mexico	16,821	0	0	4,074	20,894
North Dakota	6,908	0	0	1,324	8,232
Oregon	2,360	0	0	294	2,654
South Dakota	822	0	0	158	980
Washington	2,711	0	0	338	3,049
Wyoming	7,697	0	0	1,864	9,561
Oil and Gas Production	**133,252**	**0**	**-29,785**	**190,533**	**293,624**
Alaska	886	0	-308	-10	568
California	8,071				7,695
Colorado	23,147	0	-4,235	8,798	27,709
Montana	7,792	0	-4,624	27,361	30,529
Nevada	62	0	-9	19	72
New Mexico	60,446	0	-4,498	82,603	138,551
North Dakota	4,631	0	-709	4,756	8,678
Oregon	85	0	0	-37	48
South Dakota	367	0	-13	154	507
Utah	5,190	0	-1,216	9,200	13,174
Wyoming	19,699	0	-14,015	53,848	59,533
Tribes	2,875	0	-158	3,841	6,559
Residential Heating - LPG	**4,373**	**0**	**0**	**700**	**5,000**
Alaska	32	0	0	9	41
Arizona	215	0	0	46	260
California	1,146				1,072
Colorado	549	0	0	117	666
Idaho	421	0	0	90	511
Montana	158	0	0	67	226
Nevada	124	0	0	53	177
New Mexico	340	0	0	72	412
North Dakota	301	0	0	5	307
Oregon	162	0	0	44	206
South Dakota	286	0	0	5	291

Table A-3. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Control	Growth	2018 (tons)
Utah	150	0	0	64	214
Washington	355	0	0	96	451
Wyoming	107	0	0	23	130
Tribes	25	0	0	11	36
Residential Heating - Natural Gas	**45,564**	**0**	**0**	**10,526**	**54,424**
Alaska	751	0	0	151	902
Arizona	1,654	0	0	949	2,602
California	21,978				20,312
Colorado	5,419	0	0	3,109	8,528
Idaho	958	0	0	550	1,508
Montana	943	0	0	500	1,443
Nevada	1,499	0	0	794	2,293
New Mexico	1,688	0	0	969	2,657
North Dakota	515	0	0	57	572
Oregon	1,809	0	0	363	2,172
South Dakota	593	0	0	65	658
Utah	3,860	0	0	2,044	5,904
Washington	3,374	0	0	677	4,050
Wyoming	508	0	0	291	799
Tribes	15	0	0	8	23
Woodstoves and Fireplaces	**13,649**	**0**	**0**	**404**	**14,230**
Alaska	157	0	0	6	164
Arizona	183	0	0	8	191
California	3,761				3,938
Colorado	916	0	0	40	956
Idaho	170	0	0	7	177
Montana	273	0	0	16	290
Nevada	118	0	0	7	125
New Mexico	144	0	0	6	150
North Dakota	181	0	0	0	181
Oregon	4,293	0	0	176	4,470
South Dakota	213	0	0	0	213
Utah	150	0	0	9	159
Washington	2,851	0	0	117	2,968
Wyoming	238	0	0	10	248
Tribes	0	0	0	0	0
OTHER	**83,404**	**0**	**0**	**20,767**	**100,206**
Alaska	3,853	0	0	514	4,367
Arizona	3,402	0	0	1,469	4,872
California	30,872				26,906
Colorado	1,552	0	0	209	1,761

Table A-3. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Control	Growth	2018 (tons)
Idaho	23,824	0	0	10,093	33,917
Montana	704	0	0	118	821
Nevada	880	0	0	170	1,051
New Mexico	4,886	0	0	3,175	8,060
North Dakota	959	0	0	101	1,060
Oregon	4,526	0	0	970	5,496
South Dakota	669	0	0	192	862
Utah	1,766	0	0	108	1,875
Washington	4,384	0	0	2,097	6,481
Wyoming	1,119	0	0	1,550	2,668
Tribes	7	0	0	1	9
CENRAP Area Sources	**672,142**	**0**	**0**	**0**	**0**
Arkansas	24,563				
Iowa	5,867				
Kansas	42,197				
Louisiana	97,974				
Minnesota	59,566				
Missouri	33,062				
Nebraska	14,720				
Oklahoma	115,134				
Texas	279,051				
Tribes	8				

Table A-4. Itemization of Changes Projected to Area Sources Emissions Between 2002 and 2018 (SO_2), Version 1

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
WRAP Area Sources (all categories)	**103,577**	**0**	**0**	**22,814**	**124,136**
Commercial/Institutional Heating - Bituminous Coal	**8,550**	**0**	**0**	**793**	**9,343**
Alaska	2,474	0	0	353	2,828
Arizona	2	0	0	0	3
Colorado	2,054	0	0	205	2,260
Idaho	106	0	0	11	116
Montana	30	0	0	0	30
Nevada	11	0	0	0	11
New Mexico	63	0	0	6	70
South Dakota	1	0	0	0	2
Utah	1,749	0	0	3	1,753
Washington	186	0	0	27	212
Wyoming	1,872	0	0	187	2,059
Commercial/Institutional Heating - Natural Gas	**138**	**0**	**0**	**21**	**159**
Alaska	5	0	0	1	6
Arizona	7	0	0	3	10
California	72				72
Colorado	5	0	0	2	7
Idaho	4	0	0	2	6
Montana	4	0	0	2	6
Nevada	5	0	0	2	7
New Mexico	4	0	0	2	5
North Dakota	3	0	0	0	3
Oregon	8	0	0	2	10
South Dakota	3	0	0	0	3
Utah	2	0	0	0	2
Washington	16	0	0	1	21
Wyoming	1	0	0	4	1
Tribes	0	0	0	0	0
Industrial Combustion - Bituminous Coal	**26,031**	**0**	**0**	**1,556**	**27,587**
Arizona	918	0	0	30	948
Idaho	1,746	0	0	56	1,803
Montana	1,095	0	0	77	1,173
Nevada	4,935	0	0	348	5,283
New Mexico	508	0	0	16	525
South Dakota	6,966	0	0	687	7,653
Utah	0	0	0	0	0

Table A-4. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
Wyoming	9,111	0	0	294	9,404
Industrial Combustion - Distillate Oil	**26,956**	**0**	**0**	**4,900**	**31,953**
Arizona	1,117	0	0	285	1,402
California	249				346
Colorado	2,920	0	0	744	3,665
Idaho	90	0	0	23	113
Montana	1,450	0	0	219	1,670
Nevada	7,301	0	0	1,104	8,404
New Mexico	878	0	0	224	1,102
North Dakota	3,068	0	0	194	3,263
Oregon	1,453	0	0	347	1,800
South Dakota	1,769	0	0	112	1,881
Washington	3,200	0	0	765	3,965
Wyoming	3,461	0	0	882	4,343
Industrial Combustion - Residual Oil	**11,132**	**0**	**0**	**13,382**	**25,445**
Alaska	130	0	0	-108	22
Arizona	55	0	0	193	248
California	2,555				3,486
Idaho	7	0	0	25	32
Nevada	396	0	0	-251	145
New Mexico	2,913	0	0	10,194	13,106
North Dakota	254	0	0	190	444
Oregon	2,693	0	0	-2,244	449
South Dakota	752	0	0	564	1,317
Wyoming	1,377	0	0	4,819	6,196
Oil and Gas Production	**3,828**	**0**	**0**	**0**	**110**
Alaska	66				1
California	57				52
Colorado	260				9
Montana	227				8
Nevada	1				0
New Mexico	1,444				17
North Dakota	358				3
South Dakota	8				0
Utah	147				5
Wyoming	1,213				16
Tribes	48				1
Residential Heating - LPG	**82**	**0**	**0**	**5**	**97**
Alaska	0	0	0	0	0
Arizona	1	0	0	0	2

Table A-4. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
California	61				71
Colorado	4	0	0	1	5
Idaho	3	0	0	1	4
Montana	1	0	0	0	1
Nevada	1	0	0	0	1
New Mexico	2	0	0	0	3
North Dakota	2	0	0	0	2
Oregon	1	0	0	0	1
South Dakota	2	0	0	0	2
Utah	1	0	0	0	1
Washington	2	0	0	0	3
Wyoming	1	0	0	1	1
Tribes	0	0	0	0	0
Residential Heating - Natural Gas	**296**	**0**	**0**	**67**	**379**
Alaska	5	0	0	1	6
Arizona	11	0	0	6	17
California	145				162
Colorado	35	0	0	20	54
Idaho	6	0	0	4	10
Montana	6	0	0	3	9
Nevada	9	0	0	5	14
New Mexico	11	0	0	6	17
North Dakota	3	0	0	0	4
Oregon	12	0	0	2	14
South Dakota	4	0	0	0	4
Utah	25	0	0	13	38
Washington	22	0	0	4	26
Wyoming	4	0	0	2	6
Woodstoves and Fireplaces	**1,931**	**0**	**0**	**56**	**2,011**
Alaska	24	0	0	1	25
Arizona	28	0	0	1	29
California	550				574
Colorado	177	0	0	8	185
Idaho	26	0	0	1	27
Montana	42	0	0	2	44
Nevada	11	0	0	1	11
New Mexico	22	0	0	1	23
North Dakota	28	0	0	0	28
Oregon	616	0	0	25	642
South Dakota	33	0	0	0	33

Table A-4. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
Utah	23	0	0	0	24
Washington	332	0	0	1	346
Wyoming	20	0	0	14	21
Tribes	0	0	0	1	0
OTHER	**24,633**	**0**	**0**	**2,034**	**27,051**
Alaska	2,828	0	0	328	3,156
Arizona	538	0	0	215	753
California	4,625				5,010
Colorado	1,104	0	0	211	1,314
Idaho	928	0	0	-318	610
Montana	443	0	0	48	491
Nevada	286	0	0	33	319
New Mexico	714	0	0	172	886
North Dakota	2,031	0	0	79	2,110
Oregon	5,149	0	0	357	5,506
South Dakota	628	0	0	144	773
Utah	1,635	0	0	129	1,764
Washington	2,879	0	0	417	3,296
Wyoming	843	0	0	219	1,062
Tribes	1	0	0	0	1
CENRAP Area Sources	**321,088**	**0**	**0**	**0**	**0**
Arkansas	27,887				
Iowa	3,286				
Kansas	14,023				
Louisiana	83,292				
Minnesota	15,558				
Missouri	48,183				
Nebraska	7,744				
Oklahoma	11,731				
Texas	109,383				
Tribes	1				

Table A-5. Itemization of Changes Projected to Area Sources Emissions Between 2002 and 2018 (PM_{10}), Version 1

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
WRAP Area Sources (all categories)	1,861,810	-3,168	-705	339,110	2,208,103
Agriculture Production - Crops	**812,343**	**0**	**-705**	**27,432**	**838,372**
Arizona	17,088	0	-705	0	16,383
California	36,186				35,489
Colorado	90,207	0	0	3,260	93,467
Idaho	15,429	0	0	558	15,986
Montana	89,485	0	0	3,234	92,718
Nevada	559	0	0	20	579
New Mexico	17,158	0	0	620	17,778
North Dakota	235,684	0	0	8,517	244,201
Oregon	32,379	0	0	1,170	33,549
South Dakota	156,837	0	0	5,668	162,505
Utah	20,626	0	0	745	21,372
Washington	95,762	0	0	3,461	99,222
Wyoming	3,034	0	0	110	3,144
Tribes	1,910	0	0	69	1,979
Commercial/Institutional Heating - Natural Gas	**2,139**	**-896**	**0**	**22**	**152**
Alaska	58	-54	0	1	5
Arizona	86	-80	0	3	8
California	1,177				64
Colorado	224	-209	0	7	22
Montana	50	-47	0	1	5
Nevada	75	-70	0	2	7
New Mexico	47	-43	0	1	5
North Dakota	40	-37	0	0	3
Oregon	99	-93	0	2	8
South Dakota	37	-34	0	0	3
Washington	208	-194	0	4	18
Wyoming	37	-35	0	1	4
Tribes	1	-1	0	0	0
Construction	**669,647**	**0**	**0**	**239,890**	**922,721**
Alaska	5,326	0	0	4,099	9,425
Arizona	61,695	0	0	32,336	94,032
California	70,655				83,839
Colorado	52,168	0	0	23,649	75,817
Idaho	27,050	0	0	9,079	36,130
Montana	27,913	0	0	8,453	36,366
Nevada	52,443	0	0	26,483	78,925

Table A-5. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
New Mexico	76,802	0	0	28,797	105,599
North Dakota	20,571	0	0	4,284	24,855
Oregon	93,264	0	0	39,918	133,182
South Dakota	10,984	0	0	3,036	14,020
Utah	6,478	0	0	2,652	9,130
Washington	140,333	0	0	52,271	192,604
Wyoming	23,964	0	0	4,831	28,795
Tribes	2	0	0	0	2
Food and Kindred Products	**23,256**	**0**	**0**	**3,366**	**26,603**
Alaska	228	0	0	96	325
Arizona	1,973	0	0	596	2,569
California	12,288				12,269
Colorado	1,843	0	0	359	2,202
Idaho	431	0	0	199	630
Montana	365	0	0	76	441
Nevada	109	0	0	27	136
New Mexico	619	0	0	152	771
North Dakota	180	0	0	39	219
Oregon	1,746	0	0	735	2,481
South Dakota	252	0	0	28	280
Utah	605	0	0	153	758
Washington	2,411	0	0	873	3,284
Wyoming	205	0	0	32	237
Mining and Quarrying	**146,311**	**0**	**0**	**45,522**	**191,970**
Alaska	3,644	0	0	1,822	5,466
Arizona	9,923	0	0	2,173	12,096
California	1,377				1,514
Montana	29,250	0	0	8,420	37,670
Nevada	12,142	0	0	2,548	14,691
New Mexico	8,745	0	0	3,539	12,284
North Dakota	27,683	0	0	10,905	38,588
Oregon	6,246	0	0	3,123	9,370
South Dakota	34,473	0	0	8,618	43,091
Washington	6,767	0	0	2,236	9,003
Wyoming	5,999	0	0	2,118	8,117
Tribes	62	0	0	18	80
Oil and Gas Production	**189**	**0**	**0**	**0**	**177**
California	189				177
Open Burning - Land Clearing Debris	**15,723**	**0**	**0**	**5,804**	**21,527**
Arizona	2,189	0	0	1,272	3,461

Table A-5. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
Montana	888	0	0	143	1,031
Nevada	215	0	0	148	363
New Mexico	1,159	0	0	336	1,496
North Dakota	37	0	0	3	39
Oregon	1,834	0	0	651	2,485
South Dakota	205	0	0	25	230
Washington	8,805	0	0	3,190	11,995
Wyoming	392	0	0	36	428
Open Burning - Residential Household Waste	**24,803**	**0**	**0**	**8,521**	**33,324**
Alaska	664	0	0	236	899
Arizona	2,773	0	0	1,612	4,385
Idaho	5,819	0	0	1,953	7,772
Montana	1,235	0	0	199	1,434
Nevada	367	0	0	253	620
New Mexico	1,936	0	0	562	2,498
North Dakota	884	0	0	64	948
Oregon	3,501	0	0	1,243	4,744
South Dakota	1,115	0	0	136	1,250
Utah	131	0	0	52	183
Washington	6,012	0	0	2,178	8,190
Wyoming	367	0	0	34	401
Residential Heating - Natural Gas	**3,216**	**-1,249**	**0**	**41**	**275**
Alaska	61	-57	0	1	5
Arizona	134	-125	0	5	14
California	1,876				143
Colorado	438	-408	0	17	47
Montana	76	-71	0	3	8
Nevada	90	-84	0	3	9
New Mexico	136	-127	0	5	15
North Dakota	42	-39	0	0	3
South Dakota	48	-45	0	0	4
Washington	273	-254	0	4	22
Wyoming	41	-38	0	2	4
Tribes	1	-1	0	0	0
Woodstoves and Fireplaces	**130,820**	**0**	**0**	**3,644**	**136,235**
Alaska	1,746	0	0	72	1,818
Arizona	2,097	0	0	91	2,188
California	41,298				43,069
Colorado	11,388	0	0	495	11,883

Table A-5. Cont.

	2002 (tons)	Actual Post-2002 Adjustments	Future Controls	Growth	2018 (tons)
Idaho	2,263	0	0	98	2,362
Montana	3,025	0	0	180	3,206
Nevada	640	0	0	38	678
New Mexico	1,565	0	0	68	1,633
North Dakota	2,000	0	0	0	2,000
Oregon	37,628	0	0	1,546	39,175
South Dakota	2,361	0	0	0	2,361
Utah	1,575	0	0	94	0
Washington	20,854	0	0	857	1,669
Wyoming	2,378	0	0	103	21,711
Tribes	0	0	0	0	2,482
OTHER	**33,364**	**-1,024**	**0**	**4,869**	**36,746**
Alaska	3,316	-148	0	421	3,590
Arizona	2,006	-38	0	779	2,747
California	14,887				14,424
Colorado	1,606	-32	0	225	1,799
Idaho	0	0	0	-3,233	1
Montana	920	-36	0	3,364	1,014
Nevada	1,369	-19	0	397	1,747
New Mexico	1,214	-125	0	1,122	2,211
North Dakota	502	-120	0	34	415
Oregon	761	-12	0	182	931
South Dakota	2,729	-36	0	312	3,005
Utah	840	-22	0	349	1,167
Washington	2,117	-236	0	399	2,279
Wyoming	1,094	-198	0	519	1,415
Tribes	2	-2	0	0	0
CENRAP Area Sources	**1,849,378**	**0**	**0**	**0**	**0**
Arkansas	74,599				
Iowa	55,303				
Kansas	161,963				
Louisiana	95,076				
Minnesota	304,452				
Missouri	93,331				
Nebraska	36,332				
Oklahoma	121,772				
Texas	906,497				
Tribes	52				

APPENDIX B

ERRATA

Potential Changes to Version 1 of the WRAP 2018 Base Case Emissions Inventory

- Wyoming: Wyoming's point source inventory was revised on November 18, 2005. This revision was not included in the 2018 base case inventory since it came too late in the process.

- Confederated Tribes of the Yakama Nation: Point source emissions for Yakama Forest Products were added to the 2002 inventory for this Native American Reservation after the 2002 emissions inventory had been incorporated into the 2018 base case calculations. Thus, emissions were not projected for this point source.

- North Dakota: Emissions for three new post-2002 facilities could not be included in the 2018 base case inventory because only hourly emissions (and not annual emissions) were provided:

  — North Border #5 Compressor Station

  — Manning Compressor Station

  — Silurian Compressor Station

- Arapahoe Tribe of the Wind River Reservation: The tribal environmental agency indicated operation of a new post-2002 facility, South Pavilion Compressor Station, although annual emissions were not provided so this source could not be included in the 2018 base case inventory.

- Oregon: VOC emission reductions for two wood products facilities (Boise Cascade in White City and La Grande) were not included in the 2018 base case projections due to problems matching the SCCs in the 2002 inventory and information received from the State. If these problems were resolved, the VOC reductions (totaling approximately 273 tons) could be applied to the 2018 base case inventory.

- Wyoming and Washington: Emissions for six new post-2002 facilities could not be included in the 2018 base case files (NIF and IDA) files due to missing county FIPS):

  — Burlington Resources, Big Horn Wells (WY, ID 00012)

  — Chevron USA Table Rock Field (WY)

  — Chevron USA Whitney Canyon, Carter Creek (WY)

  — ExxonMobil Corporation, Black Canyon (WY)

  — Sierra Pacific Industries (WA, ID 1118)

  — Olympic Panel Products (WA, ID 2100284)

- Investigate potentially overestimated PM_{10} from construction/wind erosion (SCC 2311000100) in Washington and Oregon.