

**HISTORIC AND FUTURE
SO₂ EMISSIONS ANALYSIS
9 STATE WESTERN
REGION**

E.H. Pechan & Associates, Inc.

DRAFT REPORT

**5528-B Hempstead Way
Springfield, VA 22151**

**703-813-6700 telephone
703-813-6729 facsimile**

**3622 Lyckan Parkway
Suite 2002
Durham, NC 27707**

**919-493-3144 telephone
919-493-3182 facsimile**

**P.O. Box 1575
Shingle Springs, CA 95682**

530-672-0441 telephone & facsimile

Prepared for:

Western Governors' Association
1515 Cleveland Place, Suite 200
Denver, CO 80202

Prepared by:

E.H. Pechan & Associates, Inc.
5528-B Hempstead Way
Springfield, VA 22151

July 28, 2000

Pechan Rpt. No. 00.07.001/9406.001

CONTENTS

	Page
TABLES	iv
ACRONYMS AND ABBREVIATIONS	v
CHAPTER I	
INTRODUCTION	1
CHAPTER II	
HISTORIC SO ₂ EMISSIONS ANALYSIS	3
A. RACT/BACT/LAER CLEARINGHOUSE	4
B. SMELTERS	4
C. NON-SMELTERS	7
D. FACILITY-LEVEL DATA	10
CHAPTER III	
SO ₂ EMISSION PROJECTIONS	11
A. PROJECTION METHODS	11
B. PROJECTION RESULTS	13
C. ALTERNATE PROJECTION INFORMATION	19
1. Copper Smelters	19
2. Petroleum Refining	20
CHAPTER IV	
RECOMMENDATIONS	25
REFERENCES	27
APPENDIX A	
FACILITY-LEVEL SO ₂ EMISSIONS DATA	A-1

TABLES

	Page
II-1	Point Source Data Contacts 5
II-2	Smelter SO ₂ Emissions Summary 6
II-3	State-Level Non-Smelter SO ₂ Emissions Summary 8
II-4	Reasons for 1990 to 1998 SO ₂ Emissions Changes 9
III-1	Copper Smelter SO ₂ Emission Projections (tpy) 14
III-2	Non-Smelter SO ₂ Emission Projections (tpy) 15
III-3	Non-Smelter SO ₂ Emission Projections (tpy) - MTF Sector 16
III-4	Non-Smelter Regional SO ₂ Emission Projections - Existing versus New Source Components 17
III-5	Example Calculation - Refinery Source 18
III-6	Copper Market - International Firms 21
III-7	Copper Prices - Actual and Projected 22
A-1	Facility-Level SO ₂ Emissions Data - 100 tpy or More SO ₂ in 1996-1998 A-2
A-2	Facilities with Less Than 100 tpy SO ₂ in 1996-1998 A-6
A-3	Oregon Data A-8

ACRONYMS AND ABBREVIATIONS

BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
DOE	U.S. Department of Energy
EIA	Energy Information Administration
EPA	U.S. Environmental Protection Agency
GCVTC	Grand Canyon Visibility Transport Commission
IAS	Integrated Assessment System
LAER	Lowest Achievable Emission Rate
MTF	Market Trading Forum
NAPAP	National Acid Precipitation Assessment Program
RACT	Reasonably Available Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
SCC	Source Classification Code
SIP	State Implementation Plan
SO ₂	sulfur dioxide
TIP	Tribal Implementation Plan
tpy	tons per year
USGS	U.S. Geological Survey
WGA	Western Governors' Association
WRAP	Western Regional Air Partnership

CHAPTER I

INTRODUCTION

The Market Trading Forum (MTF) has been working diligently to advance discussions and reach consensus on the regional sulfur dioxide (SO₂) emission milestones and basic elements of backstop cap-and-trade program designed to assure that regional milestones are achieved. These components of the regional haze program need to be submitted to the U.S. Environmental Protection Agency (EPA) in October 2000 by the Western Regional Air Partnership (WRAP) in the form of an Annex to the Grand Canyon Visibility Transport Commission (GCVTC) report, and will form the basis of regional haze and State and tribal implementation plan (SIP and TIP) submittals by States and tribes wishing to comply with the requirements of the regional haze rule.

A majority of the MTF, in October 1999, agreed to a provisional 2018 milestone of 540,000 tons of SO₂ across the region based on the best information available at that time, and the understanding that the data and the emissions projections would be reviewed and trued-up. However, the latest estimates of year 2000 actual emissions have raised concerns among some stakeholders because the 2000 emissions appear to be well below previous expectations. Thus, some stakeholders now believe that the original milestone agreement no longer represents adequate further reductions to meet the requirements of the regional haze regulations. Other stakeholders maintain that the original agreement is sufficient in light of early reductions achieved in the region, as well as the forecasts and intentions of the GCVTC. In addition, EPA has raised concerns about the Best Available Retrofit Technology (BART) emission reduction estimate that was used by the MTF in the provisional 2018 milestone agreement. EPA recently provided an alternative BART range.

The analysis provided in this report examines the historic (1990 to 1998) SO₂ emissions from non-utility point sources in the western region. The study area is comprised of the following States: Oregon, Idaho, Wyoming, California, Nevada, Utah, Colorado, Arizona, and New Mexico. The historic emissions analysis focuses on three years: 1990, 1996, and 1998. As part of this historic data analysis, all non-utility point sources with an SO₂ emissions change of 250 tons per year (tpy), or more, between 1990 and 1998 were investigated to determine the primary reasons for this emissions change. The historic SO₂ emissions analysis is presented in Chapter II of this report.

The second part of the analysis performed for this study is an SO₂ emissions projection. Using 1998 as a baseline, SO₂ emission projections were made to 2003, 2008, 2013, and 2018. These emission projections were made using growth factors, retirement rates, and new source control factors from the GCVTC Integrated Assessment System (IAS). The emissions projection analysis is described in Chapter III.

Recommendations for future study are provided in Chapter IV.

CHAPTER II

HISTORIC SO₂ EMISSIONS ANALYSIS

This chapter provides an analysis of the non-utility point source emissions in the nine western States during the period 1990 to 1998. The three primary years of focus are 1990, 1996, and 1998. The western States whose emissions were evaluated in this study include Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Wyoming.

The starting point for the analyses performed for this project was a Microsoft Excel file received from Pat Ryan on June 18, 2000 with the filename EMISSION.XLS. The information in the following columns was used directly:

1. State
2. State ID
3. County ID
4. Facility ID (Radian)
5. IAS Region
6. SIC
7. MTF Sector
8. Sector Description
9. Mike George Facility Name
10. Source Type
11. WRAP 1990 (SO₂ Emissions)
12. 1996 (SO₂ Emissions)

The 1998 SO₂ emission estimates were taken from one of two columns labeled *Mike George's WRAP-1099 file* or *Latimer*.

The decision rules used to select the appropriate 1998 SO₂ emission estimate were as follows:

1. If the *Source: Mike George's WRAP-1099 file* column had a numeric entry, it was used.
2. Otherwise, the emission estimate in the *Latimer* column was used.
3. The exception to the above was that the *Latimer* column was used in total for all Oregon, Utah, and Wyoming point sources.

Once this composite emissions data file was compiled, two columns were added to record information about the primary reasons for emissions changes that were observed from 1990 to 1998. Then, State air pollution control agencies were contacted for information about why SO₂ emission changes occurred from 1990 to 1998. This analysis focused on facilities whose SO₂ emissions changed by more than 250 tpy (up or down) over this period. A summary of the State contacts and the auxiliary files and other information that was provided to Pechan during this State consultation process is in Table II-1.

A. RACT/BACT/LAER CLEARINGHOUSE

The EPA RACT/BACT/LAER Clearinghouse (RBLC) was used to query for situations where SO₂ emissions were affected in the western States. RACT, BACT, and LAER are acronyms for different program requirements under the Clean Air Act.

1. RACT, or Reasonably Available Control Technology, is required on existing sources in areas that are not meeting national ambient air quality standards (i.e., nonattainment areas).
2. BACT, or Best Available Control Technology, is required on major new or modified sources in clean areas (i.e., attainment areas).
3. LAER, or Lowest Achievable Emission Rate, is required on major new or modified sources in nonattainment areas.

However, data in the Clearinghouse is not limited to just sources subject to these requirements. Noteworthy prevention and control technology decisions are included in the RBLC even if they are not related to RACT, BACT, or LAER decisions.

This data base did not identify situations where SO₂ emissions in the western States were influenced by emission limits. Queries were run for SO₂ for each of the three EPA regions with States in the study area (Regions VIII, IX, and X). Searches were limited to RBLC determinations added during or after January 1990. No facilities matched the search criteria for Region X. Only one facility matched the criteria for Region VIII. This was a cogeneration plant with NO_x controls specified in the RBLC, but no SO_x control. The Region IX query generated a list of about 30 facilities in California (one in Arizona), but all were minor sources of SO₂ that did not appear in the 9-State emissions data set.

B. SMELTERS

Table II-2 lists the 9-State smelter emissions for 1990, 1996, and 1998. This information is unchanged from that received from the WRAP Data Working Group. Note that this table includes both smelters and mines. The largest plant level emissions change results from the plant modernization that occurred at the Kennecott smelter in Utah during the mid-1990s. The Asarco Hayden smelter in Arizona had a 31 day major shutdown in March/April 1998. During this shutdown, the flash furnace was rebuilt and the existing gas handling system was replaced. During the third quarter of 1999, Phelps Dodge temporarily closed its Hidalgo smelter in New Mexico and the smaller of its two concentrators at its Morenci, Arizona mining complex. The production curtailment will result in an average reduction of approximately 150 million pounds of total annual copper production, but allows the company to retain its ability to smelt substantially all of its copper concentrates internally at its Chino smelter in New Mexico, and continue to produce most of the acid consumed by its mining operations.

**Table II-1
Point Source Data Contacts**

State	Contact	Data Sources and Comments
1. Arizona	Mike George	1998 SO ₂ emission estimates from Latha Toopal, Arizona DEQ
2. California	Jon Taylor	Cal_sox_summary1.xls
3. Colorado	Roy Doyle	SO2INVNE.XLS
4. Idaho	Matt Stoll	Revised emission estimates for the NU WEST (now AGRUIM) facility. Current year emission estimates were provided by EPA Region X.
5. Nevada	Colleen Cripps Al Leskys (Clark County Health District)	Provided 1998 SO ₂ emissions for NV. Provided estimates for Chemical Lime and Titanium Metals
6. New Mexico	Dave Wunker	Some 1998 SO ₂ emission estimates are from AIRS Data (June 23, 2000). New Mexico data updates received in emissiontbl_rev.xls.
7. Oregon	Steve Aalbers	Provided corrections to some SO ₂ emission estimates for all 3 historical years - oregoncorrections.xls
8. Utah	Brock LeBaron	No changes to previously supplied SO ₂ emission estimates
9. Wyoming	Lee Gribovicz	TABLE51.XLS received on July 17, 2000 from Lee Gribovicz

**Table II-2
Smelter SO₂ Emissions Summary**

State	Facility Name (1990)	SO₂ tpy 1990	SO₂ tpy 1996	SO₂ tpy 1998
Arizona	ASARCO SMELTER - HAYDEN	29,814	33,124	22,077
Arizona	BHP(Magma Metals)	15,900	16,678	10,409
Arizona	CYPRUS MIAMI MINE	5,676	5,737	6,097
Arizona	Cyprus Sierrita	800	548	<100
New Mexico	PHELPS DODGE/CHINO MINES	28,058	14,784	15,685
New Mexico	PHELPS DODGE/HIDALGO SMELTER	41,433	32,121	29,188
Utah	Kennecott Utah Copper Corp.	26,829	1,556	762
	Totals	148,510	104,549	84,218

C. NON-SMELTERS

Table II-3 summarizes the 1990 to 1998 SO₂ emissions for the non-smelters. This table shows that 1996 non-smelter SO₂ emissions declined by 11 percent from 1990 levels. Non-smelter SO₂ emissions remained stable from 1996 to 1998. The major factors in the SO₂ emission changes by State are described below:

1. Arizona – reductions in SO₂ from 1990 to 1998 in this State are primarily attributable to the process changes at Stone Container, now Abitibi.
2. California – Observed changes in SO₂ emissions in this State during the 1990s are a combination of factors, including fuel switching, oil and gas industry production changes, and refinery crude quality.
3. Colorado – sulfur emissions are relatively constant over the time period 1990 to 1998.
4. Idaho – Emission changes are produced by production variations during the 1990s. Note that the 1990 emission estimates for this State are from the 1985 National Acid Precipitation Assessment Program (NAPAP) inventory, so they are not 1990 emissions estimates.
5. New Mexico – Emissions during 1990 are dominated by gas plants. Changes to previous SO₂ emission estimates that were provided by the New Mexico Bureau of Air Quality were mostly changing potential to emit values to actual emissions.
6. Nevada – There are a small number of non-utility facilities in Nevada. Note that not all 1996 emission estimates were corroborated by the State, or the Clark County Health District, so 1996 emission estimates shown may not be actual values.
7. Oregon – Emissions in this State are dominated by the pulp and paper industry. In addition, Reynolds Metals has some significant production variations during the 1990s that affect Statewide emission trends, as well.
8. Utah – Most of the SO₂ emission reductions in Utah resulted from controls required by the PM₁₀ SIP for the Salt Lake City nonattainment area.
9. Wyoming – Emission changes in this State were affected mostly by new well field drilling programs during 1996 and 1998.

Changes in emissions that have occurred over this period were classified into six categories: (1) market-driven production changes, (2) plant closures, (3) process changes, (4) fuel switching, (5) controls in response to air pollution control regulations, and (6) emission estimation method changes.

Table II-4 summarizes the emission changes that have been estimated to occur over this period according to the primary reason for the emission change. This analysis was

**Table II-3
State-Level Non-Smelter SO₂ Emissions Summary**

State	SO₂ tpy 1990	SO₂ tpy 1996	SO₂ tpy 1998
Arizona	8,989	3,138	4,150
California	35,973	37,366	36,640
Colorado	8,273	8,440	7,461
Idaho	24,350	22,806	22,299
Nevada	1,143	340	521
New Mexico	37,145	36,395	32,756
Oregon	8,360	4,202	6,716
Utah	26,592	7,646	6,418
Wyoming	32,326	42,292	45,134
Totals	183,151	162,625	162,095

Table II-4
Reasons for 1990 to 1998 SO₂ Emissions Changes

Primary Reason for Emission Change	1990 to 1998 SO₂ Emissions Change (tpy)
Market driven production changes	(8,114)
Plant shutdowns	4,336
Process changes	12,755
Fuel switch	1,923
Controls in response to air regulations	22,544
Emission estimation method change	4,773
Total	38,217

based primarily on information provided by State and local air pollution control agency staff about facility SO₂ emissions that changed by more than 250 tons per year over this period. Smelter emissions changes are not included in this table. Table II-4 shows that the more than one-half of the observed emission change from 1990 to 1998 from this sector was in response to air pollution control emission regulations. However, most of the 22 thousand ton emission reduction occurred at sources in Utah, so the reduction was not evenly spread over the western State region. The reductions observed in Utah were in PM₁₀ nonattainment areas.

Other significant factors affecting SO₂ emissions from non-smelter point sources in the region included market-drive production changes (these increased regional SO₂ emissions), process changes, and emission estimation method changes. Note that emission estimation method changes are artificial, rather than real reductions in SO₂. In addition, there are instances where more than one of these factors influenced facility-level emission changes. Only the primary factor is represented in Table II-4 (one was selected for each facility).

D. FACILITY-LEVEL DATA

Facility-level emission estimates that have been used to perform this analysis are provided in Appendix A. This information is sorted by State, and then alphabetically by plant name within the State. Facility name changes that have occurred during the study period are noted.

CHAPTER III

SO₂ EMISSION PROJECTIONS

This chapter presents the smelter and other non-utility sector source SO₂ emission projections to 2018. For non-utilities, IAS methods were used to estimate potential emissions in 2003, 2008, 2013, and 2018. In short, this analysis takes the best estimates of 1998 SO₂ emissions at the facility-level, and applies IAS growth and retirement rates, and new source emission rates to establish a baseline future year forecast.

A. PROJECTION METHODS

Figure III-1 summarizes the emission projection techniques used in this study for the non-smelters. The starting point for the emission projections is the facility-level SO₂ emission estimates described in Chapter II. Because the IAS Model is organized so that emissions are projected by IAS cell (a combination of IAS Region and source category (scc_id)), more detail about the individual source types within a plant is needed than is provided by a facility-level emission estimate. To solve this problem, the 1998 facility-level emissions were allocated to Source Classification Codes (SCC) using the SO₂ emission proportions from the 1990 GCVTC inventory (Radian, 1995). Then, these SO₂ emissions by SCC were linked with IAS cells (region and scc_id). The IAS cells determine the growth factors, retirement rates, and new versus existing source control factors.

The growth factors, retirement rates, and new source control factors are too voluminous to display in this report. Readers interested in more detail about the projection methods are referred to the two reports prepared by Pechan during 1999 to document (Pechan, 1999a) and augment (Pechan, 1999b) the IAS model for the Western Governors' Association (WGA). There are also reports by Argonne and Decision Focus, Inc. from 1995 that provide the most detailed reporting of the IAS model development. These reports are all cited on the reference page of this report.

Note that all of the IAS model data bases that were used in this analysis were those received from Pat Ryan in June 2000. This version of the model should include all of the non-utility augmentations that were made in the Spring of 1999 (see Pechan, 1999b). While modifications were being made to the utility sector modeling portion of IAS during 2000, those updates would not affect the non-utility modeling data bases.

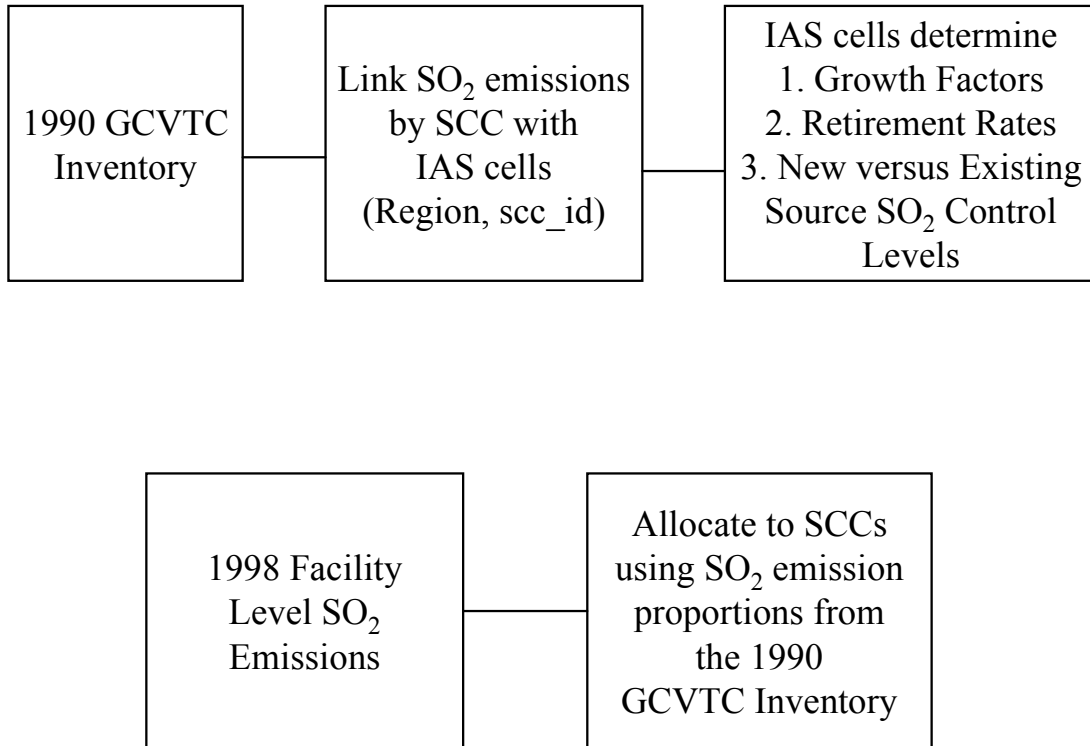
The following equation illustrates the emission projection calculation that was performed for each of the projection y years in this analysis.

$$EM_{py} = EM_{by} * (1 - RT_{py}) + NWCT * EM_{by} * (GF_{py} - (1 - RT_{py}))$$

where:

$$\begin{aligned} EM_{py} &= \text{Projection year emissions} \\ EM_{by} &= \text{Base year emissions} \end{aligned}$$

**Figure III-1
Emission Projection Methods Diagram**



- RT_{py} = Percent retired in projection year
- NWCT = Emission level for new sources (relative to existing)
- GF_{py} = Growth factor for projection year

Essentially, the equation is simply:

$$EM_{py} = EM_{ex,py} + EM_{nw,py}$$

where:

- EM_{ex,py} = Residual emissions from existing sources (base year minus retirements)
- EM_{nw,py} = New source emissions due to growth and retirement, at the new source emission level

B. PROJECTION RESULTS

Table III-1 presents the SO₂ emission projections for copper smelters for 2003 to 2018 that have been agreed upon by the Emissions Forum and the MTF. This projection assumes that copper smelter operations and emissions remain constant over the 20 year projection time horizon at near 1998 emission levels. Note that Kennecott Utah Copper Corporation SO₂ emissions listed in Table III-1 only include the smelter emissions from that facility. Boiler emissions from this facility are included in the utility sector analysis.

Non-smelter SO₂ emission projection results for 2003, 2008, 2013, and 2018 are shown in Table III-2 for each of the nine western States. For the nine State region, the IAS-based emission projections show that non-smelter emissions are expected to decrease from 162,100 tpy in 1998 to 140,760 tpy in 2018 – a 13 percent decline. Expected changes in any individual State are directly related to the industry types in that State, and IAS region-based growth factors for those industries. States with expected SO₂ emissions over the 20 year forecast period include Arizona, Colorado, and Nevada. Idaho’s SO₂ emissions are expected to remain constant over the forecast period. States with expected SO₂ emission declines by 2018 include California, New Mexico, Oregon, Utah, and Wyoming.

Regional SO₂ emission projection results by MTF Sector are in Table III-3, and provide some insight about how industry differences affect the results. Because the Oil and Gas Industry (MTF Sector 6) dominates the SO₂ emissions in this region, the SO₂ emissions for this sector are further broken down among Oil/Gas Production, Petroleum Refining, and Other. Table III-3 shows that the expected declines in SO₂ emissions over the 20 year forecast horizon are largely attributable to the expected reductions from oil/gas production and refineries.

Table III-4 shows the regional breakdown between existing source and new source emissions in the future year SO₂ emission projections. This information is provided to assist the MTF in making SO₂ emission allocations for new versus existing sources.

Table III-5 presents an example SO₂ emissions projection to 2018 for a petroleum refinery using IAS-based methods. This example shows how the various SO₂ sources within the facility are treated in the 20 year projection. The IAS model uses source categories, listed as scc_id’s in Table III-5 to link emission sources with growth factors, retirement rates, and new source control levels. The scc_id *inpere* represents process sources at refineries. In this example, the refinery process sources are a blowdown system

**Table III-1
Copper Smelter SO₂ Emission Projections (tpy)**

State	Facility Name	2003	2008	2013	2018
Arizona	ASARCO Smelter-Hayden	23,000	23,000	23,000	23,000
Arizona	BHP-San Manuel	16,000	16,000	16,000	16,000
Arizona	CYPRUS MIAMI MINE	8,000	8,000	8,000	8,000
New Mexico	PHELPS DODGE-CHINO MINES	16,000	16,000	16,000	16,000
New Mexico	PHELPS DODGE-HIDALGO SMELTER	22,000	22,000	22,000	22,000
Utah	Kennecott Utah Copper Corp.	1,000	1,000	1,000	1,000
Total Copper Smelter		86,000	86,000	86,000	86,000

**Table III-2
Non-Smelter SO₂ Emission Projections (tpy)**

State	1998	2003	2008	2013	2018
Arizona	4,150	4,508	4,977	5,266	5,695
California	36,641	34,926	33,037	31,131	29,237
Colorado	7,461	7,492	7,586	7,555	7,621
Idaho	22,300	22,346	22,441	22,298	22,342
Nevada	521	591	656	723	789
New Mexico	32,755	30,319	27,882	25,443	23,006
Oregon	6,716	6,690	6,630	6,512	6,439
Utah	6,418	6,278	6,145	5,989	5,851
Wyoming	45,135	43,808	42,484	41,118	39,784
Totals	162,100	156,960	151,840	146,030	140,760

**Table III-3
Non-Smelter SO₂ Emission Projections (tpy)
MTF Sector**

	1998	2003	2008	2013	2018
1 Electricity	553	550	547	544	541
3 Wood/Paper/Pulp	9,321	9,443	9,603	9,598	9,722
4 Cement/Concrete	7,699	8,423	9,152	9,747	10,447
5 Chemicals/Plastic	20,185	20,211	20,287	20,147	20,176
6 Oil/Gas					
SIC 13 Oil/Gas Production	52,356	49,267	46,171	43,088	39,995
SIC 29 Refining	47,901	44,810	41,684	38,484	35,340
Other	376	362	347	333	318
7 Food	4,564	4,484	4,399	4,309	4,223
8 Glass	2,035	2,279	2,487	2,690	2,897
9 Miscellaneous	2,679	2,644	2,610	2,567	2,531
10 Metals/Mining/Minerals	14,428	14,485	14,551	14,526	14,573
Totals	162,100	156,960	151,840	146,030	140,760

**Table III-4
 Non-Smelter Regional SO₂ Emission Projections
 Existing versus New Source Components**

	2003	2008	2013	2018
Sources Existing in 1998	150,216	138,333	126,448	114,564
New Sources	6,744	13,504	19,587	26,200
Totals	156,960	151,840	146,030	140,760

**Table III-5
Example Calculation - Refinery Source**

SCC	scc_id	1998 SO₂ tons	20 Year Growth Factor	20 Year Retirement Fraction	New Source Control Level	2018 SO₂ tons
30600401	inpere	1,781	1.00	0.42	0.1	1,108
30601201	inpere	2,703	1.00	0.42	0.1	1,682
30600201	inpere	582	1.00	0.42	0.1	362
10200501	inoibo	190	1.25	0.12	1.0	134
30103202	ptesc2uc	44	1.45	0.42	0.022	27
30102306	ptsap2uc	116	1.45	0.42	0.3	94
Totals		5,416				3,407

with vapor recovery and flaring, a fluid coking unit, and a fluid catalytic cracking unit. SO₂ emissions from these units are expected to decline substantially over the 20 year forecast period because the growth factor is 1.0 (no growth in activity/production), 42 percent of the existing production capacity is replaced with units that emit at new source emission rates, and this new source emission rate is 10 percent of the existing source rate. As a result, the *inpere* scc_id emissions in 2018 are about 40 percent lower in 2018 than they were in 1998.

This example facility also has an oil-fired industrial boiler, which is scc_id *inoibo* in Table III-5. There is much less of an expected reduction in SO₂ emissions from oil-fired boilers in this IAS Region because the growth factor (1.25) indicates a 25 percent expected increase in activity, only 12 percent of the existing capacity is expected to retire over the 20 year period, and existing and new source SO₂ emission rates are the same.

The final two scc_ids in the Table III-5 example represent a sulfur plant, and a sulfuric acid plant, respectively. These sources have a higher growth factor than the other sources at this refinery, retirement rates equal to those for refinery process sources, and new source control levels that represent 97.8 percent, and 70 percent control from existing source rates, respectively. The result is a slight downward SO₂ emission trend for these sulfur and acid plants.

C. ALTERNATE PROJECTION INFORMATION

This section of the SO₂ emission projection chapter describes some alternate data sources that were consulted to provide more information to the MTF about the viability, or uncertainty, of the growth and retirement assumptions used in the projections performed for this study. Such information is presented here for the copper industry and the petroleum refinery industry.

1. Copper Smelters

The U.S. Geological Survey (USGS) has now taken over the responsibility for commodity analyses and forecasts that was performed for many years by the Bureau of Mines. The USGS commodities contact (Edelstein, 2000) provided the following information related to copper smelter production in the United States:

- Recent U.S. copper production from concentrates:

1998	1,436,000 tons
1999	1,086,000
2000	880,000
2001	850,000
- Three smelters have closed since 1998
- 850,000 tons would be a good long-term forecast
- No expansion expected, only contraction

Downward pressure on copper prices resulting from international competition produced a consolidation of the copper industry in the Southwestern United States. This began in the first half of 1999 with production reductions and closure of facilities owned by Asarco, BHP, and Phelps Dodge. In July 1999, Asarco and Cyprus announced a proposal to merge the two companies to take advantage of synergies between the companies' various assets in

the Southwestern United States. Then, in August 1999, Phelps Dodge announced its intention to acquire both Asarco and Cyprus Amax in a stock transaction. In September 1999, Grupo Mexico made a cash bid for Asarco. In the end, Grupo Mexico purchased Asarco in a cash transaction.

The upshot of the above is that U.S. copper smelting activity is now strongly affected by international price competition, as well as by decisions by international firms that use U.S. assets as one portion of their integrated company. Table III-6 lists the firms that participate in the international copper market. These firms' holdings (smelters and mines) in the nine western States included in this study are also listed in this table. This leaves the two major firms operating facilities in the U.S. market as Grupo Mexico and Phelps Dodge.

Because copper industry consolidation in the late 1990s was precipitated by the sharp drop in copper prices, Table III-7 offers evidence about future copper price trends. This table shows the nearly 50 percent drop in the price per pound of copper that occurred from 1995 to 1999. While this Deutsche Bank projection shows some rebounding in the expected future copper price from the 1999 value, the 2004 estimate is still below one dollar per pound. This suggests that there might be some increased copper production as prices rebound from 71 cents per pound, but that the increase will not be substantial. Note that current copper prices are below the 2000 estimate listed in Table III-7.

2. Petroleum Refining

Two information sources were consulted for expected future U.S. petroleum refining activity: the *Oil and Gas Journal*, and the U.S. Department of Energy (DOE), Energy Information Administration (EIA) *Annual Energy Outlook*. The *Oil and Gas Journal* 1998 Refining Report noted that grassroots petroleum refining activity (i.e., new plant construction) has been on hold in the United States for the past 20 years. Since 1990, about 30 U.S. refineries have been shut down (many with a capacity of less than 100,000 barrels per day). Historical refinery utilization has increased from 66 percent capacity utilization in 1982 to more than 94 percent in 1997. The maximum sustainable operating factor is about 95 percent. This source expects increased oil and gasoline demand in the United States to be met by more refined product imports.

The DOE *Annual Energy Outlook*, 2000 says that it is unlikely that new refineries will be built in the United States. Additions at existing refineries are expected to increase total U.S. refining capacity. (This is at odds with the *Oil and Gas Journal* view.) National energy modeling performed by DOE for the *Annual Energy Outlook* includes both high and low growth cases. The 1998 base capacity is 16.3 million barrels per day. In 2020, the low and high growth cases show domestic capacity increasing to 17.6 million barrels per day and 18.3 million barrels per day, respectively. These are 8 percent and 12 percent increases from the 1998 level. Almost all of the capacity increases are expected to occur on the Gulf Coast.

Table III-6
Copper Market - International Firms

Firms	U.S. Smelters/Mines
BHP	San Manuel
Cominco	
Falconbridge	
Freeport McMoran	
Grupo Mexico	Hayden
MIM	
Phelps Dodge	Hidalgo, Chino, Cyprus Miami
Rio Algom	
Rio Tinto	Kennecott Utah

Table III-7
Copper Prices - Actual and Projected

Year	LME Price (U.S. \$/lb)
1995 actual	1.33
1996 actual	1.04
1997 actual	1.03
1998 actual	0.75
1999 actual	0.71
2000 estimate	0.88
2001 estimate	1.00
2002 estimate	0.90
2003 estimate	0.99
2004 estimate	0.99

SOURCE: Deutsche Bank, 2000.

The above information can be compared with the 1.00 growth factor applied in the IAS model for most petroleum refining sources. This growth factor seems appropriate for the western States given that refineries are operating at close to maximum capacity and that any expansion of existing refinery capacity is likely to occur at Gulf Coast refineries, which are outside the study region.

CHAPTER IV RECOMMENDATIONS

If the IAS model is to continue to be used as a planning tool by the MTF, then it is recommended that a 2000 base year data base similar to the GCVTC emission inventory for 1990 be developed to establish a new baseline year. The most important component of this 2000 data base is having a regionally consistent point source emissions data base. Once a 2000 base year data set is available, then it is appropriate to update growth factors and retirement rates being used for the every ten year emission projections. This is important both to reflect the new base year, and to account for more recent information about regional growth expectations.

With the establishment of an SO₂ emissions allowance market and a tracking system, it is recommended that steps be taken to eliminate the potential differences in SO₂ emissions associated with changing emission estimation methods. In the historic data analysis performed for this study, changes in emission estimation methods were responsible for over 6 thousand tons of the emissions difference between 1990 and 1998. While this amount is a small fraction of the total observed emissions difference in this period, it is still important. A standard stack test, or other confirming emissions measurement is needed. An EPA AP-42 emission factor application to estimate emissions should be insufficient for establishing base year SO₂ levels. On the other hand, requiring continuous emission monitoring is probably too much of an expense for facilities that have 100 to 1,000 tpy of SO₂ emissions.

REFERENCES

- Argonne, 1995a: Argonne National Laboratory, Decision and Information Sciences Division, "Development of Emission Control and New Technology Options for the Grand Canyon Visibility Transport Region - Volume I, Technology Costs, Performance and Applicability," prepared for Grand Canyon Visibility Transport Commission, under contract to Decision Focus, Inc., October 1995.
- Argonne, 1995b: Argonne National Laboratory, Decision and Information Sciences Division, "Development of Emission Control and New Technology Options for the Grand Canyon Visibility Transport Region - Volume II, Regulatory Requirements," prepared for Grand Canyon Visibility Transport Commission, under contract to Decision Focus, Inc., October 1995.
- Argonne, 1995c: Argonne National Laboratory, "Identification of Base (1990) Control Levels and Control Level Adjustments (1990-2000) to Stationary and Area Source Emission Categories," prepared for Grand Canyon Visibility Transport Commission, under contract to Decision Focus, Inc., May 1995.
- Deutsche Bank, 2000: Grupo Mexico - A New Global Mining Giant, January 25, 2000.
- DFI, 1995: Decision Focus, Inc., "Integrated Assessment System User's Guide," Washington, DC, prepared for the Grand Canyon Visibility Transport Commission, October 31, 1995.
- DOE, 1999: U.S. Department of Energy, Energy Information Administration, "Annual Energy Outlook 2000 - with Projections to 2020," DOE/EIA-0383(2000), Washington, DC, [www.eia.doe.gov/oiaf/aeo/index.html], December 1999.
- Edelstein, 2000: Dan Edelstein, Copper Forecasts, U.S. Geological Survey, Reston, VA, email correspondence to J. Wilson, E.H. Pechan & Associates, Inc., June 27, 2000.
- Oil and Gas, 1998: *Oil and Gas Journal*, Refining Report, 1998.
- Pechan, 1999a: E.H. Pechan & Associates, Inc., Springfield, VA, "Grand Canyon Visibility Transport Commission Integrated Assessment System Documentation Summary," prepared for Western Governors Association, 1999.
- Pechan, 1999b: E.H. Pechan & Associates, Inc., Springfield, VA, "Emissions Information Acquisition and Verification Task 2.2 - Other Point Source Costing," prepared for Western Governors' Association, 1999.
- Radian, 1995: Radian Corporation, "An Emission Inventory for Assessing Regional Haze on the Colorado Plateau," prepared for the Grand Canyon Visibility Transport Commission, January 23, 1995.

APPENDIX A

FACILITY-LEVEL SO₂ EMISSIONS DATA

This appendix contains the facility-level SO₂ emission estimates for 1990, 1996, and 1998 that were received from the WRAP Emissions Forum and revised according to State air pollution control agency comments during the course of this project. Table A-1 lists all of the facilities in the nine western States (smelters and other non-utilities) that emitted 100 tpy of SO₂ or more, on average, during 1996 and 1998. Table A-2 lists the western State facilities with less than 100 tpy SO₂ in 1996-1998. Table A-3 provides some revisions to the Oregon SO₂ emission estimates that were received after the emission projections were completed. Incorporating these revisions into the analysis would increase 1998 emissions by 800 to 900 tpy of SO₂.

**Table A-1
Facility-Level SO₂ Emissions Data
100 tpy or More SO₂ in 1996-1998**

State	State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO ₂ tpy 1990	SO ₂ tpy 1996	SO ₂ tpy 1998	SO ₂ tpy 1990 vs. 1998	Primary Reason for Emissions Change	Notes
AZ	4	007	0004	45	3331	2	Copper	ASARCO SMELTER - HAYDEN		29814	33124	22077	7737		Process gases from the flush furnace and the converter are controlled by an acid plant.
AZ	4	021	0032	46	3331	2	Copper	BHP(Magma Metals)	BHP - San Manuel	15900	16678	10409	5491		New acid plant installation and upgrades and replacements to existing. On standby.
AZ	4	007	0006	45	3331	2	Copper	CYPRIUS MIAMI MINE		5876	5737	6097	421		
AZ	4	019	0040	46	1021	2	Copper	Cyprus Sierrita		800	548	<100			
NM	35	017	0001	64	3331	2	Copper	PHELPS DODGE/CHINO MINES		28058	14784	15685	12373		
NM	35	023	0003	64	3331	2	Copper	PHELPS DODGE/HIDALGO SMELTER		41433	32121	29188	12245		On standby.
UT	49	035	0030	32	3331	2	Copper	Kennecott Utah Copper Corp.		28829	1556	762	28067		Plant modernization
AZ	4	025	0011	41	1489	10	Metals/Mining/Minerals	CHEMICAL LIME (CHEMSTAR)		148510	104549	84218	64292		
AZ	4	003	0003	47	1489	10	Metals/Mining/Minerals	Chemical Lime (Douglas)		141	122	639	498		1 Increased production
AZ	4	025	0007	41	3241	4	Cement/Concrete	Phoenix Cement		<100	196	339			1 Increased production
AZ	4	017	0007	43	2611	3	Wood/Paper/Pulp	STONE CONTAINER	ABITIBI	8536	2455	2448	6088		3 Process changes. An alkaline scrubber is used to control SO ₂ emissions from Powerhouse Boiler #2.
CA	6	037	800012	14	2911	6	Oil/Gas	ARCO (NSR USE ONLY)	ARCO PRODUCTS CO	1919	2399	1706			RECLAIM facility
CA	6	037	47232	14	2999	6	Oil/Gas	ARCO COC KILN INC		442	343	404			RECLAIM facility
CA	6	037	9	14	3221	4	Glass	BALL-FOSTER GLASS CONTAINER CO		<100	<100	166			
CA	6	029	20	13	3241	4	Cement/Concrete	CAL PORTLAND CEMENT CO.		285	245	245			
CA	6	083	7	3295	10	Missing	CALAVERAS CEMENT CO		286	286	286				
CA	6	037	800030	14	2911	6	Oil/Gas	CHEVRON U.S.A. INC (EIS USE) - EL SEGUNDO	CHEVRON PRODUCTS CO.	833	1795	938			4 Burning distillate oil now
CA	6	013	10	11	2911	6	Oil/Gas	CHEVRON USA INC - RICHMOND	CHEVRON PRODUCTS COMPANY	1291	1018	1413			RECLAIM facility
CA	6	029	310	13	4612	6	Oil/Gas	CHEVRON-BITTERWATER PUMP STN.		166	<100	138			
CA	6	095	15	11	2911	6	Oil/Gas	EXXON CORPORATION - BENICIA		4922	6042	5779	856.6		1 Variations in crude throughput and quality
CA	6	099	11	3221	8	Glass	GALLO GLASS CO		61	271	269			4 Fuel switch	
CA	6	013	23	11	2819	5	Chemicals/Plastics	GENERAL CHEMICAL CORPORATION		206	201	212			
CA	6	019	77	12	3211	8	Glass	GUARDIAN INDUSTRIES CORP.		546	433	406			
CA	6	085	17	11	3241	4	Cement/Concrete	KAISER CEMENT CORPORATION	HANSON PERMANENT CEMENT	474	464	416			
CA	6	029	133	13	2911	6	Oil/Gas	KERN OIL & REFINING CO.		319	425	443			
CA	6	087	11	11	3241	4	Cement/Concrete	LONE STAR INDUSTRIAL CEMENT PLANT		250	286	392			
CA	6	039	18	12	3221	8	Glass	MADERA GLASS COMPANY		108	170	190			
CA	6	045	23	10	2499	3	Wood/Paper/Pulp	MASONITE HARBOUR DIV		102	102	102			
CA	6	017	7	11	2421	3	Wood/Paper/Pulp	MICH-CAL LBR CO	SIERRA PACIFIC INDUSTRIES	271	271	271			
CA	6	071	7000000	15	3241	4	Cement/Concrete	MITSUBISHI CEMENT		28	574	946	918.4		4 Intermittent use of coal
CA	6	037	800089	14	2911	6	Oil/Gas	MOBIL OIL CORP (EIS USE) - TORRANCE	MOBIL OIL CORP (EIS USE)	256	807	725	469.1		1 RECLAIM facility - variations in crude throughput and quality
CA	6	077	17	11	3221	8	Glass	LOWENS ILLINOIS	LOWENS-BROCKWAY GLASS CONTAINER	319	265	218			

Table A-1 (continued)

State	State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO2 tpy 1990	SO3 tpy 1996	SO2 tpy 1998	SO2 tpy 1990 vs. 1996	Primary Reason for Emissions Change	Notes
CA	6 037	7427	32	14 3221	8	8	Glass	OWENS-BROCKWAY GLASS CONTAINER - VERNON	NOW PLANT ID 11887	193	323	280	278		RECLAIM facility
CA	6 013			11 2911	6	6	Oil/Gas	PACIFIC REFINING COMPANY		278	290	0	278		Plant shutdown - discuss with BACQIND
CA	6 019			12 3211	8	8	Glass	PPG IND. INC	PPG INDUSTRIES		159	159			
CA	6 037	800131	20	14 2819	5	5	Chemicals/Plastics	RHONE-POULENC BASIC CHEMICALS - CARSON	RHODIA INC.	319	167	337			RECLAIM facility
CA	6 013			11 2819	5	5	Chemicals/Plastics	RHONE-POULENC BASIC CHEMICALS - MARTINEZ		289	443	242			RECLAIM facility
CA	6 071			15 3241	4	4	Cement/Concrete	RIVERSIDE CEMENT COMPANY		0	527	527	528.7		Intermittent use of coal
CA	6 029	25	211	13 2911	6	6	Oil/Gas	SAN JOAQUIN REFINERY	SAN JOAQUIN REFINING COMPANY	337	313	138			Production changes according to steam generation needs
CA	6 013			11 2911	6	6	Oil/Gas	SANTA FE ENERGY	TEXACO CA INC	1539	855	2050	510.9		Production changes according to steam generation needs
CA	6 023	21	11	10 2611	3	3	Wood/Paper/Pulp	SHELL OIL COMPANY - MARTINEZ	MARTINEZ REFINING COMPANY	2790	2518	2374	415.6		1 Fuel switch - Shasta Co. AQMD
CA	6 029	800223	19	14 2911	6	6	Oil/Gas	SIMPSON PAPER COMPANY	SIMPSON PAPER CO	1021	315	315	708.1		4
CA	6 029			13			Oil/Gas	TEXACO EXPLOR & PROD INC		1	89	112			
CA	6 029			14 2911	6	6	Oil/Gas	TEXACO REFINING & MARKETING IN - WILMINGTON		546	727	590			RECLAIM facility
CA	6 029	19	13	13 2911	6	6	Oil/Gas	TEXACO REFINING AND MARKETING - BAKERSFIELD	EQUILON ENTERPRISES LLC	471	190	94	377.1		1 Oil and gas production changes
CA	6 013	13	11	11 2911	6	6	Oil/Gas	TOSCO CORP. AVON REFINERY		766.1	4469	5422	2238.6		1 Variations in crude throughput and quality
CA	6 037	800026	14	14 2911	6	6	Oil/Gas	ULTRAMAR INC (NSR USE ONLY)		341	959	689	328.1		RECLAIM facility - Variations in crude throughput and quality
CA	6 013	22	11	11 2989	6	6	Oil/Gas	UNION CHEMICALS - RODEO	TOSCO REFINING COMPANY	1606	1535	1474			
CA	6 037	800144	14	14 2911	6	6	Oil/Gas	UNION OIL CO OF CAL (NSR USE O	TOSCO REFINING COMPANY	724	1005	806			RECLAIM facility
CA	6 001	83	11	13 3221	10	10	Metals/Mining/Minerals	UNITED STATES PIPE & FOUNDRY C		127	122	111			
CA	6 027	7	12	10 1061	10	10	Metals/Mining/Minerals	UNITED STATES TUNGSTEN CORP.		123	123	123			
CA	6 079	4	13	13 2911	6	6	Oil/Gas	UNOCAL CARBON	TOSCO SANTA MARIA REFINERY						
CA	6 079	4	13	13 2911	6	6	Oil/Gas	UNOCAL CHEM DIV-UNOCAL CORP - ARROYO GR	TOSCO	3034	3950	0	3034		
CA	6 013	16	11	11 2911	6	6	Oil/Gas	UNOCAL CORPORATION - RODEO	TOSCO RODEO REFINERY	584	728	675			
CA	6 037			14 2911	6	6	Oil/Gas	UNOCAL REFINING & MARKETING CO	TOSCO REFINING (L.A.)	0	343	508	508.4		RECLAIM facility, new source since 1990
CA	6 079	13	13	13 2911	6	6	Oil/Gas	UNOCAL-SANTA MARIA REFINERY	TOSCO SANTA MARIA REFINERY	647	225	3501	2854.4		
CO	8 101	0048	58	3312	10	10	Metals/Mining/Minerals	CFI		353	318	316			
CO	8 001	0004	53	2911	6	6	Oil/Gas	COLO REFINING		632	664	526			
CO	8 001	0003	53	2911	6	6	Oil/Gas	CONOCO DENVER		2336	2610	2496			
CO	8 059	0008	53	3221	8	8	Glass	COORS GLASS	ROCKY MOUNTAIN BOTTLE	159	221	234			
CO	8 069	0002	52	3241	4	4	Cement/Concrete	HOLNAMI PORTLAND		623	623	375			
CO	8 043	0001	56	3241	4	4	Cement/Concrete	HOLNAMI PORTLAND		3669	3615	3219			
CO	8 001	0097	53	4952	9	9	Misc.	METRO WASTEWATER		134	229	135			
CO	8 013	0003	53	3241	4	4	Cement/Concrete	SOUTHWEST PORTLAND		967	160	160	807		6 Stack test data lowered emission estimates
ID	16 005	0004	7	3241	4	4	Cement/Concrete	ASHGROVE CEMENT		790	200	200	590		6 Emissions estimation method changes
ID	16 023	0001	3	9611	9	9	Misc.	DOE-INEEL		928	1847	1847	919		1 Production changes
ID	16 077	0005	7	2819	5	5	Chemicals/Plastics	FMC	ASTARIS	2976	4994	4994			1 Production low in 1990 - the recent year emission estimates were provided by Region X EPA (Steve Body)
ID	16 067	0001	3		7	7	Food	MAGIC VALLEY FOODS			118	118			
ID	16 029	0001	7	2819	5	5	Chemicals/Plastics	MONSANTO/P4 PRODUCTION		7543	7988	7601			
ID	16 029	0003	7	2824	5	5	Chemicals/Plastics	NU WEST	AGRUM	1338	799	962	386		3 Process changes

Table A-1 (continued)

State	ID	State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO2 tpy 1990	SO3 tpy 1996	SO2 tpy 1998	SO2 tpy 1990 vs. 1996	Primary Reason for Emissions Change	Notes
	ID	16	069	0001	3	2621	3	Wood/Paper/Pulp	POTLATCH		1379	700	700	679	6	Permitted emission limits in 1990 versus actual emissions in 1996 and 1998
	ID	16	065		2		9	Misc.	RICKS COLLEGE		7181	193	193			Emissions are from a boiler
	ID	16	077	0006	7	2874	5	Chemicals/Plastics	SIMPLOT		2637	2637	2637	4544	6	Emissions estimation method changes
	ID	16	027	0010	3	2083	7	Food	TASCO (NAMPA)		1008	1680	1787	779	1	Varying crop yields
	ID	16	067	0001	3	2063	7	Food	TASCO (PAUL)		608	306	217	391	1	Varying crop yields
	ID	16	083	0001	3	2083	7	Food	TASCO (TWIN)		599	1364	1053	454	1	Varying crop yields
NM		35	015	0024	65	1311	6	Oil/Gas	AGAVE ENERGY/AYTES PLANT		962	962	962			Allowable is 2863 tpy
NM		35	015	0002	65	1311	6	Oil/Gas	ARCO PERMIAN/EMPIRE ABO GAS PLANT		700	565	565			
NM		35	025	0004	65	1321	6	Oil/Gas	CONOCO/MALJAMAR GAS PLANT	MALJAMAR GAS PLANT	3573	1464	3574			
NM		35	045	0023	60	2911	6	Oil/Gas	GIANT INDUSTRIES/BLOOMFIELD REF		676	772	920			1988 value is from AIRS
NM		35	031	0008	61	2911	6	Oil/Gas	GIANT REFINING/CINIZA REFINERY		1346	1115	1779			1988 value is from AIRS
NM		35	025	0044	65	1321	6	Oil/Gas	GPM GAS EUNICE GAS PLANT	VERSADO GAS PRODUCERS LLC	1988	1933	1933			
NM		35	015	0011	65	1321	6	Oil/Gas	GPM GAS/ARTESIA GAS PLANT	DUKE ENERGY/ARTESIA GAS PLANT	1459	1516	1516			
NM		35	015	0006	65	1311	6	Oil/Gas	GPM GAS/INDIAN HILLS AMINE PLANT		900	450	450	450	6	Potential value in 1990, then actual in 1998, 1998
NM		35	025	0046	65	1311	6	Oil/Gas	GPM GAS/LEE GAS PLANT		818	0	818			
NM		35	025	0035	65	1321	6	Oil/Gas	GPM GAS/LINNAM RANCH GAS PLANT		274	1302	1302	1028		
NM		35	025	0007	65	1311	6	Oil/Gas	J.L. DAVIS GAS PROCESS/DENTON		385	890	891	506		
NM		35	015	0008	65	1321	6	Oil/Gas	MARATHON OIL/INDIAN BSN GAS PLT		1460	852	1460			
NM		35	015	0010	65	2911	6	Oil/Gas	NAVAJO REFINING/ARTESIA REFINERY		1549	1552	969	580	5	SRU tail gas cleanup unit installed
NM		35	015	0138	65	4911	1.1	Electricity	PAN ENERGY/BURTON FLATS GAS PLT	DUKE ENERGY/BURTON FLATS		196	196			
NM		35	015	0285	65	4911	1.1	Electricity	PAN ENERGY/DAGGER DRAW GAS PLT	DUKE ENERGY/DAGGER DRAW	1206	218	247	666	5	SRU installed in 1992 Potential emissions listed in 1990.
NM		35	025	0008	65	1321	6	Oil/Gas	SID RICHARDSON GASOLINE/JAL#3			540	540			Potential emissions listed in 1990.
NM		35	025	0055	65	1321	6	Oil/Gas	TEXACO/BUCKEYE GASOLINE PLANT		2329	2490	2933	604		Allowable is 5146
NM		35	025	0052	65	1311	6	Oil/Gas	TEXACO/EUNICE NORTH GAS PLANT		673	1076	1346	673		Increases above 673 allowable with upsets
NM		35	025	0051	65	1311	6	Oil/Gas	TEXACO/EUNICE SOUTH GAS PLANT		4019	4386	3355	664		Also UNION PACIFIC GATHERING & PROC. CO/HUBER
NM		35	015	0004	65	1311	6	Oil/Gas	TRANSWESTERN PIPE	DUKE ENERGY/HUBER GAS	221	231	231			
NM		35	041	0001	63	1311	6	Oil/Gas	WARREN PETROLEUM/MONUMENT PLANT		270	3348	582	312		1988 value is from AIRS
NM		35	025	0060	65	1321	6	Oil/Gas	WARREN PETROLEUM/EUNICE GAS PLANT	EUNICE GAS PLANT	3285	2388	2388	897	5	SRU installed in 1992 Potential emissions listed in 1990.
NM		35	025	0061	65	1311	6	Oil/Gas	WARREN PETROLEUM/MONUMENT PLANT	MONUMENT PLANT	1460	1709	1432			
NM		35	025	0063	65	1321	6	Oil/Gas	WARREN PETROLEUM/SAUNDERS PLANT	SAUNDERS PLANT	913	3312	1387	474		
NM		35	025	0064	65	1321	6	Oil/Gas	WARREN PETROLEUM/VADA GAS PLANT		1204	2149	0			3 Flare shutdown in 1998. Green gas routed to another plant.
NM		35	045	0247	60	1311	6	Oil/Gas	WESTERN GAS PROCESSORS/SAN JUAN RYR	CHEMICAL LIME CO	5475	980	980			Declining H2S content
NV		32	003	0003	22	3274	10	Metals/Mining/Minerals	CHEMSTAR APEX		783	175				
NV		32	019	410387	20	3241	4	Cement/Concrete	NEVADA CEMENT COMPANY		360	340	346			
OR		41	045		?	2062	7	Food	Amalgamated Sugar Company, The		594	415	1235	641	1	Increasing production - capturing more emissions under Title V
OR		41	009	1849	6	2621	3	Wood/Paper/Pulp	Boise Cascade Company		459	685	746	287		
OR		41	041	0005	5	2631	3	Wood/Paper/Pulp	Georgia-Pacific West, Inc.		56	123	322	266	1	Production changes

Table A-1 (continued)

State	State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO2 tpy 1990	SO3 tpy 1996	SO2 tpy 1998	SO2 tpy 1990 vs. 1998	Primary Reason for Emissions Change	Notes
OR	41	019		?		10	Metals/Mining	Glenbrook Nickel Company		7	174	113		1	Production changes and ore supply differences
OR	41	039	2125	5	3339	10	Metals/Mining/Minerals	Globe Metallurgical Inc.		204	200	228			
OR	41	019	0036	5	2631	3	Wood/Paper/Pulp	International Paper		874	342	1006			
OR	41	007	0004	5	2621	3	Wood/Paper/Pulp	James River II, Inc.		331	573	573			
OR	41	065	0001	5	3334	10	Metals/Mining/Minerals	Northwest Aluminum Company, Inc.		423	448	375			
OR	41	051	1876	5	3221	8	Glass	Owens-Brockway Glass Container, Inc.		103	114	113			
OR	41	043	3501	5	2621	3	Wood/Paper/Pulp	Pope & Talbot Pulp, Inc.		485	133	133	352	5	New acid gas scrubber (PSD application)
OR	41	051	1851	5	3334	10	Metals/Mining/Minerals	Reynolds Metals Company		3340	0	503	2837	1	Low production - market driven
OR	41	071	6142	5	2621	3	Wood/Paper/Pulp	Smurfit Newsprint Corporation 2		592	368	461			
OR	41	039	8866	5	2421	3	Wood/Paper/Pulp	Weyerhaeuser Company		119	201	127			
OR	41	039		5		3		Weyerhaeuser Particle board		377	372	296		1	Market driven production changes
OR	41	043	0471	5	2631	3	Wood/Paper/Pulp	Willamette Industries, Inc.		396	54	485			
UT	49	035	0004	32	2911	6	Oil/Gas	Amoco Petroleum Products		6701	983	1116	5585	5	Added a sulfur recovery unit - PM10 SIP
UT	49	049	0004	33	8221	9	Misc.	Brigham Young University		248	90	158			
UT	49	027	0001	35	1081	10	Metals/Mining/Minerals	Brush Wellman Inc.		161	175	208			
UT	49	011	0003	31	2911	6	Oil/Gas	Chevron Products Company		2424	1116	845	1579	5	Added a sulfur recovery unit - PM10 SIP
UT	49	027	-9902	35	1499	10	Metals/Mining/Minerals	Continental Lime Inc.		115	297	275			
UT	49	011	0008	31	2911	6	Oil/Gas	Flying J Incorporated		312	574	225			
UT	49	049	0027	33	3312	10	Metals/Mining/Minerals	Geneva Steel		8473	2020	881	7592	5	PM10 SIP requirement QBOP on blast furnaces
UT	49	029	0001	31	3241	4	Cement/Concrete	Holnam Incorporated		911	3	247	664	6	Stack test in November 1996 showed much lower emissions
UT	49	011	0013	31	2911	6	Oil/Gas	Phillips 66 Company		5672	864	862	4810	5	PM10 SIP
UT	49	037	-9901	35	2911	6	Oil/Gas	Unocal Corporation		1575	1391	1478			Oil/gas pipeline
UT	49	005		?	8221	9	Misc.	Utah State University		134	123				
WY	56	029	0012	9	1311	6	Oil/Gas	AMOCO - ELK BASIN	HOWELL PETROLEUM - ELK BASIN	1096	1218	1,422	326	3	Plant began flaring tail gas, rather than venting H2S
WY	56	041	0012	9	1311	6	Oil/Gas	AMOCO - WHITNEY CANYON		6401	5835	11,130	4729	1	Well field flaring increased with the new drilling program
WY	56	041	0009	9	1311	6	Oil/Gas	CHEVRON - CARTER CREEK		1537	1165	3,330	1793	1	Well field emissions increased after 1996
WY	56	023	0013	8	1311	6	Oil/Gas	EXXON - SHUTE CREEK		1078	1999	2,015	937	1	
WY	56	037	0010	9	1474	10	Metals/Mining/Minerals	FMC - GRANGER (TEXAS GULF)		475	473	149	326	1	Process variation
WY	56	037	0004	9	1474	10	Metals/Mining/Minerals	FMC - GREEN RIVER		4795	5256	4533	262	1	Process variation
WY	56	023	0001	8	2999	6	Oil/Gas	FMC COKING PLANT		1194	1413	1454	260	1	Process variation
WY	56	021	0001	9	2911	6	Oil/Gas	FRONTIER OIL & REFINING - CHEYENNE		1521	1769	1422			
WY	56	037	0002	9	1474	10	Metals/Mining/Minerals	GENERAL CHEMICAL		4196	5651	4,538	342	1	Process variation
WY	56	015	0001	9	2063	7	Food	HOLLY SUGAR - WORLD & TORRINGTON		374	266	154			
WY	56	043	0001	9	4911	1	Electricity	INTERENERGY - HILAND	WILDHORSE ENERGY - HILAND	21	415	110	942	1	Increased flaring
WY	56	017		9	1311	6	Oil/Gas	KCS MOUNTAIN RESOURCES - GOLDEN EAGLE		558	558	942	942	6	Flare not quantified in 1990
WY	56	003		9	1311	6	Oil/Gas	KCS MOUNTAIN RESOURCES - AINSWORTH		807	807	845	845	6	Flare not quantified in 1990

Table A-1 (continued)

State	State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO2 tpy 1990	SO3 tpy 1996	SO2 tpy 1996 vs. 1990	Primary Reason for Emissions Change	Notes
WY	56 013	0005		9 2819		5	Chemicals/Plastics	KOCH SULFUR PRODUCTS COMPANY		1104	1109	1,237		
WY	56 013	0007		9 2611		3	Wood/Paper/Pulp	LOUISIANA LAND & EXPLOR - LOST CABIN		406	4547	1,336	1	Plant constructed in 1995
WY	56 029	0007		9 1311		6	Oil/Gas	MARATHON GAS PLANT - OREGON BASIN		224	260	388		
WY	56 017	0003		9 1311		6	Oil/Gas	MARATHON OIL - MILL IRON		874	663	642	6	Flare not quantified in 1990
WY	56 037	0003		9 -999		6	Oil/Gas	SWEETWATER RESOURCES	P4 PRODUCTION - ROCK SPRINGS	578	1154	1,971	1	Process variation
WY	56 037	0022		9 2874		5	Chemicals/Plastics	SF PHOSPHATES, INC		734	1629	1,305	6	Retest shows increased emissions
WY	56 025	0001		9 2911		6	Oil/Gas	LITTLE AMERICA REFINING COMPANY	SINCLAIR - CASPER	4574	3990	3,524	6	Additional SRU added in 1993
WY	56 007	0011		9 1311		6	Oil/Gas	SINCLAIR @ SINCLAIR						
WY	56 013			9 1311		6	Oil/Gas	SNYDER OIL - RIVERTON DOME				147		
WY	56 037			9 1474		10	Metals/Mining/Mineral	SOLVAY MINERALS		101	72			
WY	56 003	0012		9 1311		6	Oil/Gas	TEXAS-BYRON PLANT	BIG HORN GAS PROCESSING - BYRON	192	169	605		413
WY	56 037	0008		9 1311		6	Oil/Gas	UNION PAC - BRADY		415	331	576		
WY	56 001	0005		9 8221		9	Misc.	UW CENTRAL HEAT PLANT		152	154	223		
WY	56 045	0001		9 2911		6	Oil/Gas	WYOMING REFINING CO	WYOMING REFINING - NEWCASTLE	603	930	804	1	Process variation
										182951	162424	162095		

A-6
 Primary Reason for Emissions Change:
 1 = Market driven production changes
 2 = Plant shutdown
 3 = Process changes
 4 = Fuel switch
 5 = Controls in response to air regulations
 6 = Emission estimation method change

**Table A-2
Facilities with Less Than 100 tpy SO₂ in 1996-1998**

State	State ID	County ID	Facility ID	IAS Regio ID	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO ₂ tpy 1990	SO ₂ tpy 1996	SO ₂ tpy 1998	SO ₂ tpy 1990 vs. 1998	Primary Reason for Emissions Change	Notes
AZ	4 005		0001	42	291	6	Oil/Gas	Intermountain Refining		803	0	0	803	2	Plant shutdown
CA	6 037		42333	14	347	10	Metals/Mining/Mineral	AMERICAN NATIONAL CAN CO		149	0	0			
CA	6 001		2086	11	322	8	Glass	ANCHOR GLASS CONTAINER CORPORA		119	0	0			
CA	6 029		206	13	131	6	Oil/Gas	BERRY PETROLEUM COMPANY		237	0	0			
CA	6 013		33	11	206	7	Food	CALIFORNIA & HAWAIIAN SUGAR CO		189	0	0			
CA	6 071		800181	15	327	4	Cement/Concrete	CALIFORNIA PORTLAND CEMENT CO		112	<100	13			
CA	6 019		71	12	131	6	Oil/Gas	CHEVRON USA INC. - COALINGA		809	0	0	809	1	Production changes according to steam generation needs
CA	6 029		312	13	461	6	Oil/Gas	CHEVRON-RIO BRAVO STATION		101	0	0			
CA	6 107		28	12	202	7	Food	DAIRYMANS COOP CREAMERY		212	0	0			
CA	6 037		800047	14	291	6	Oil/Gas	FLETCHER OIL & REF CO (EIS USE)		107	0	0			
CA	6 013		3257	11	261	3	Wood/Paper/Pulp	GAYLORD CONTAINER CORPORATION		263	0	0	263		
CA	6 037		800184	14	291	6	Oil/Gas	GOLDEN WEST REF CO (EIS USE)		232	0	0			
CA	6 099		17	11	203	7	Food	HUNT-WESSON FDS		174	0	0			
CA	6 005		21	11	491	1.1	Electricity	IONE ENERGY COMPANY		239	0	0			
CA	6 077		2	11	287	5	Chemicals/Plastics	J R SIMPLOT CO.		1389	102	89	1300.2	4	Fuel switch
CA	6 047			12				JR WOOD		0	0	0			
CA	6 077			11	321	8	Glass	LIBBEY OWENS FORD		35	110	77			
CA	6 023		37	10	261	3	Wood/Paper/Pulp	LOUISIANA-PACIFIC CORP.		302	<100	42	289.6	4	Fuel switch
CA	6 029		272	13	131	6	Oil/Gas	M H WHITTIER	SENECA RESOURCES	347	0	0	346.9	1	Production changes according to steam generation needs
CA	6 053		19	12	131	6	Oil/Gas	MOBIL OIL CORP - SAN ARDO	AERA ENERGY	304	0	1	303.4	1	Production changes according to steam generation needs
CA	6 053		12	12	327	10	Metals/Mining/Mineral	NATIONAL REFRACTORIES&MINERALS	CHEMICAL LIME CO	243	<100	69			
CA	6 077		191	11	262	3	Wood/Paper/Pulp	NEWMARK SIERRA PAPERBOARD CORP.		270	0	0	270	4	Fuel switch to gas
CA	6 001		30	11	322	8	Glass	OWENS-BROCKWAY GLASS CONTAINER - OAKLAND		122	128	64			
CA	6 037		800103	14	291	6	Oil/Gas	POWERINE OIL CO (EIS USE)		196	0	0			
CA	6 047		22	12	203	7	Food	RAGU FOODS	LIPTON	202	0	0			
CA	6 029		204	13	131	6	Oil/Gas	SHELL KERNRIDGE	AERA ENERGY LLC	284	<100	82			
CA	6 037		800115	14	291	6	Oil/Gas	SHELL OIL CO (EIS USE) - CARSON	SHELL OIL PRODUCTS	778	0	0	778		

Table A-2 (continued)

State	State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO ₂ tpy 1990	SO ₂ tpy 1996	SO ₂ tpy 1998	SO ₂ tpy 1990 vs. 1998	Primary Reason for Emissions Change	Notes
CA	6 019	64		12	131	6	Oil/Gas	SHELL WESTERN E&P INC. - COALINGA		144	0	0			
CA	6 091	1		11	242	3	Wood/Paper/Pulp	SIERRA PACIFIC INDUSTRIES		85	52	52			
CA	6 063	3		10	242	3	Wood/Paper/Pulp	SIERRA-PACIFIC INDUST.		135	<100	24			
CA	6 071			15	324	4	Cement/Concrete	SOUTHWESTERN PORTLAND CEMENT C	SOUTHDOWN-VICTORVILLE PLANT	108	0	0			
CA	6 029	331		13	131	6	Oil/Gas	SWEPI-WEST COAST DIVISION	AERA ENERGY LLC	775	<100	10	765.5	1	Oil and gas production changes
CA	6 053	30		12	131	6	Oil/Gas	TEXACO INC. - SAN ARDO		100	<100	36			
CA	6 037	800222		14	281	5	Chemicals/Plastics	TEXACO REFINING & MARKETING IN - CARSON		156	<100	26			
CA	6 099	24		11	203	7	Food	TRI-VALLEY GROWERS-#7		118	0	0			
CA	6 029	28		13	147	10	Metals/Mining/Minerals	U.S. BORAX		523	<100	4	519.4	4	Fuel switch - Mojave Desert District
CA	6 037	800143		14	281	5	Chemicals/Plastics	UNION CHEM CO (NSR USE ONLY) - WILMINGTON		209	0	0			
CA	6 071	7000003		15	106	10	Metals/Mining/Minerals	UNION MOLYCORP	MOLYCORP, UNION OIL	792	0	0	792	2	Plant shutdown - Mojave AQMD
CA	6 029	299		13	131	6	Oil/Gas	UNOCAL - BAKERSFIELD	UNOCAL OIL & GAS DIVISION	159	0	0			
CA	6 059	42775		14	131	6	Oil/Gas	WEST NEWPORT OIL CO		297	<100	10	287.5	2	Plant shutdown - SCAQMD
CO	8 059	9		53	961	9	Misc.	GENERAL SERVICES ADMINISTRATIO		409	0	0	409	4	Changed from coal to natural gas
CO	8 077	0001		55	291	6	Oil/Gas	LANDMARK PETROLEUM		157	0	0			
CO	8 045	24		51	131	6	Oil/Gas	UNOCAL RETORT-PARACHUTE		679	0	0	679	2	Plant shutdown
CO	8 045	0025		51	131	6	Oil/Gas	UNOCAL UPGRADE		177	0	0		2	Plant shutdown
CO	8 087	0001		53	206	7	Food	WESTERN SUGAR 1		127	19	20		4	Changed to lower sulfur coal
CO	8 123	0002		53	206	7	Food	WESTERN SUGAR 2		320	0	<100		4	Six coal-fired boilers replaced with natural gas
ID	16 011			?		7	Food	Idaho Supreme		106					
ID	16 039	0001		3	971	9	Misc.	MTN. HM. AFB		196	87	87			
NM	35 025	0128		65	131	6	Oil/Gas	CITATION/ANTELOPE RDG GAS PLANT		281	0	NA			
NM	35 025	0118		65	131	6	Oil/Gas	CONOCO/BELL LAKE 2 WELL #6		129	0	NA			
NM	35 015	0125		65	131	6	Oil/Gas	FEAGAN ENERGY/W DAGGER DRAW GAS PLT		240	0	NA			Plant never constructed
NM	35 035	0013		?	971	9	Misc.	HOLLOWMAN AIR FORCE BASE			3	4			Allowable is 122 tpy
NM	35 005	0050		65	131	6	Oil/Gas	YATES PETROLEUM/PATHFINDER AMINE		227	57	57			Allowable emissions listed in 1990
NV	32 023	1		21	145	10	Metals/Mining/Minerals	BASIC INC.	PREMIER SERVICES	272	3	3		1	Market influences
NV	32 021	0002		21	971	9	Misc.	HAWTHORNE ARMY AP		115	6	12			
NV	32 007			?		10	Metals/Mining	Independence Big Springs	ANGLO GOLD	166	0	0		2	Big Springs mine closed operation in 1995

Table A-2 (continued)

State	State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO2 tpy 1990	SO2 tpy 1996	SO2 tpy 1998	SO2 tpy 1990 vs. 1998	Primary Reason for Emissions Change	Notes
NV	32 003		0019	22	333	10	Metals/Mining/Minerals	TITANIUM METALS		484	7	122			
OR	41 047		5598	5	495	9	Misc.	Cascade Steel Rolling Mills, Inc.		125	0	29			
OR	41 039		8650	5	263	3	Wood/Paper/Pulp	Collins Products LLC		202	0	3			
OR	41 009		2520	5	491	1.1	Electricity	Enron Corp.		103	0	25			
OR	41 051		2028	5	517	6	Oil/Gas	Galx Terminals Corporation		180	0	3			
OR	41 029		0041	5	282	5	Chemicals/Plastics	Georgia-Pacific Resins, Inc.		1008	0	<100		3	Synthetic minor status - process change
OR	41 035		0013	6	242	3	Wood/Paper/Pulp	J. Peterkort & Company		189	0	28			
OR	41 005		1850	5	262	3	Wood/Paper/Pulp	Ogden Martin Systems of Marion, Inc.		127	0	19			
OR	41 051		2050	5	822	9	Misc.	Oregon Health Sciences University		246	0	NA			
OR	41			?		8	Glass	Owens-Corning Corporation		<100	<100	<100			
OR	41 003		0002	6	206	7	Food	Smurfit Newsprint Corporation 1		<100	<100	<100			
UT	49 049			33	145	10	Metals/Mining/Minerals	Interstate Brick Company			113	35			
UT	49 035		0034	32	806	9	Misc.	LDS Hospital		330	20	20	310	4	Coal to natural gas switch for boilers
UT	49 045		-9903	31	333	9	Metals	Magroop		99	41	41			
UT	49 035		0063	32	822	9	Misc.	University of Utah		238	7	3			
WY	56 011		0003	9	145	10	Metals/Mining/Minerals	AMERICAN COLLOID - WEST COLONY		113	80	53			Process variation
WY	56 011			9	145	10	Metals/Mining	AMERICAN COLLOID - EAST COLONY		18	66	92		4	Reduced gas/increased coal use
WY	56 025		0002	9	291	6	Oil/Gas	AMOCO REFINERY		1153	0	0	1153	2	Plant shut down in 1991
WY	56 003		0001	9	145	10	Metals/Mining/Minerals	BENTONITE CORPORATION	LOVELL	192	3	41			
WY	56 037		0014	9	131	6	Oil/Gas	COLORADO INTERSTATE GAS - TABLE ROCK		522	20	39	483	5	Controlled flaring incidents
WY	56 003		0013	9	131	6	Oil/Gas	MARATHON OIL COMPANY - GARLAND		257	7	10			Reinject sour gas
WY	56 001		0002	9	324	4	Cement/Concrete	MOUNTAIN CEMENT CO		75	54	132		1	Second kiln added in 1996
WY	56 013			?	131	6	Oil/Gas	WOLD OIL PROPERTIES - BIG SAND	WOLD OIL - SAND DRAW PLANT	159	8				
										2101	1144	1505			

Primary Reason for Emissions Change:
 1 = Market driven production changes
 2 = Plant shutdown
 3 = Process changes
 4 = Fuel switch
 5 = Controls in response to air regulations
 6 = Emission estimation method change

**Table A-3
Oregon Data Corrections (7/21/2000)**

State ID	County ID	Facility ID	IAS Region	SIC	MTF Sector	Sector Description	Facility Name (1990)	Current Facility Name (if different from 1990)	SO2 Tpy 1990	SO2 Tpy 1996	SO2 Tpy 1998	SO2 Tpy 990 vs 1998	Primary Reason for Emissions Change	Notes
OR	41 045	0002	?	2062	7	Food	Amalgamated Sugar Company, The		597	829	1235	637.52	1	Increasing production - capturing more emissions under Title V
OR	41 009	1849	6	2621	3	Wood/Paper/Pulp	Boise Cascade Company		2454	685	1457	996.57		
OR	41 047	5398	5	4953	9	Misc.	Cascade Steel Rolling Mills, Inc.		116	29	29			
OR	41 039	8850	5	2631	3	Wood/Paper/Pulp	Collins Products LLC		192	3	3			
OR	41 009	2520	5	4911	1-1	Electricity	Enron Corp.		103	0	44			
OR	41 051	2028	5	5171	6	Oil/Gas	Gaxx Terminals Corporation		180	3	3			
OR	41 029	0041	5	2821	5	Chemicals/Plastics	Georgia-Pacific Resins, Inc.		1008	0	<100		3	Synthetic minor status - process change
OR	41 041	0005	5	2631	3	Wood/Paper/Pulp	Georgia-Pacific West, Inc.		56	207	322	266	1	Production changes
OR	41 019	0007	7	3339	7	Metals/Mining/Minerals	Glenbrook Nickel Company		7	174	113		1	Production changes and ore supply differences
OR	41 039	2125	5	3339	10	Metals/Mining/Minerals	Globe Metallurgical Inc.		204	200	228			
OR	41 019	0036	5	2631	3	Wood/Paper/Pulp	International Paper		874	602	1006			
OR	41 067	2644	6	2421	3	Wood/Paper/Pulp	J. Peterkort & Company		108	34	28			SO2 value for 1998 is really 1987 TPY
OR	41 007	0004	5	2621	3	Wood/Paper/Pulp	James River II, Inc.		331	573	617	265.77		
OR	41 065	0001	5	3334	10	Metals/Mining/Minerals	Northwest Aluminum Company, Inc.		407	448	375			
OR	41 005	1850	5	2621	3	Wood/Paper/Pulp	Ogden Martin Systems of Marion, Inc.		127	13	22			
OR	41 051	2050	5	8221	9	Misc.	Oregon Health Sciences University		246	3	5			
OR	41 051	1876	5	3221	8	Glass	Owens-Brockway Glass Container, Inc.		104	169	117			
OR	41 051	1815	7	2952	7	Food	Owens-Corning Corporation		0	20	21			
OR	41 043	3501	5	2621	3	Wood/Paper/Pulp	Pope & Talbot Pulp, Inc.		485	133	92	393.17	5	New acid gas scrubber (PSD application)
OR	41 051	1851	5	3334	10	Metals/Mining/Minerals	Reynolds Metals Company		3341	0	503	2838.4	1	Low production - market driven
OR	41 003	0002	6	2063	7	Food	Smurfit Newsprint Corporation 1		<100	<100	<100			Delete this source; it does not exist.
OR	41 071	6142	5	2621	3	Wood/Paper/Pulp	Smurfit Newsprint Corporation 2		592	368	461			
OR	41 039	8866	5	2421	3	Wood/Paper/Pulp	Sierra Pine		39	0	0			
OR	41 039		5		3		Weyerhaeuser Particle board		377	372	296		1	Market driven production changes
OR	41 011	0015					Weyerhaeuser Company		19	128	127			Source was below 100 tons in 1990.
OR	41 035	0013					Collins Products LLC		192	3	3			
OR	41 043	0471	5	2631	3	Wood/Paper/Pulp	Willamette Industries, Inc.		398	54	485			

