FINAL

HAYDEN
SULFUR DIOXIDE NONATTAINMENT AREA
STATE IMPLEMENTATION
AND
MAINTENANCE PLAN

AIR QUALITY DIVISION

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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1.0 INTRODUCTION

1.1 Executive Summary

This document includes an attainment demonstration and formal request to the United States Environmental Protection Agency (EPA) to redesignate the Hayden, Arizona Sulfur Dioxide (SO_2) Nonattainment Area to attainment for the health-based 24-hour average and annual average SO_2 National Ambient Air Quality Standards (NAAQS). It summarizes the progress of the area in attaining the SO_2 standards, demonstrates that all Clean Air Act (CAA) requirements for attainment have been adopted, and includes a maintenance plan to assure continued attainment after redesignation.

The air quality record included in **Chapter 2** of this document shows that ambient air quality monitors located in the Hayden nonattainment area have recorded no violations of the primary or secondary SO_2 NAAQS since 1989. This meets the EPA requirement to demonstrate eight consecutive quarters of ambient air quality measurements below the SO_2 NAAQS.

This document also demonstrates that the emission reduction control measures responsible for the air quality improvement are both permanent and enforceable. Based on state point source and EPA National Emissions Trends (NET) mobile and area source emissions inventories, the primary source of SO_2 in the nonattainment area is the copper smelter located near Hayden, Arizona. The 2000 base-year Hayden nonattainment area emissions inventory, presented in **Chapter 4**, lists the sources in the nonattainment area and their SO_2 emissions. **Chapter 5** contains a modeling demonstration, and **Chapter 6** describes the primary control measures implemented to achieve attainment. These measures include implementation of reasonably available control measures (RACM) to reduce emissions from the smelter near Hayden.

Chapter 7 describes in detail measures designed to ensure continued maintenance of the SO_2 NAAQS for at least 10 years after redesignation of the area to attainment.

The clean air quality record, enforceable control measures, and projections of future emissions presented in this document, all demonstrate that the area has attained and will continue to maintain the SO_2 air quality standards. With this submittal, ADEQ requests that EPA approve this attainment demonstration and maintenance plan for the Hayden SO_2 nonattainment area and redesignate the area to attainment for the 24-hour and annual NAAQS.

1.2 Regulatory Background

The federal air quality standards for SO_2 were established to identify maximum ambient concentrations above which adverse effects on human health and welfare may occur. Accordingly, the SO_2 standards are divided into two types: primary and secondary. The primary standards are based on the protection of public health and the secondary standard is based on protection of the environment, including protection against damage to animals, vegetation, buildings, and decreased visibility. The original national primary and secondary NAAQS for SO_2 were codified in Volume 42 of the Code of Federal Regulations, Part 410 (42 CFR 410) on April 30, 1971, (36 FR 81875) and recodified to 40 CFR 50.4 and 50.5 on November 25, 1971 (36 FR 22384). On May 22, 1996, the

EPA promulgated the current primary and secondary NAAQS for SO_2 (61 FR 25566) as follows:[1]

Standard [2]	Annual	24-hour	3-hour
Primary	0.030 ppm (80 $\mu g/m^3$)	0.14 ppm (365 $\mu g/m^3$)	
Secondary			0.5 ppm (1300 $\mu g/m^3$)

Areas that do not meet the NAAQS may be designated nonattainment for the respective standard. The Hayden SO_2 nonattainment area comprises nine townships in southern Gila County and northeastern Pinal County. In addition, six adjacent townships are designated as unclassified (See **Figure 1.1** for location map). The current boundaries of the nonattainment and unclassified areas are codified at 40 CFR 81.303 and are defined by the complete townships on the following pages.

Table 1.1 - Study Area Definition

Hayden Area Description	Does Not Meet Primary Standards	Cannot Be Classified
T4S, R14E	X	
T4S, R15E	X	
T4S, R16E	X	
T5S, R14E	X	
T5S, R15E	X	
T5S, R16E	X	
T6S, R14E	X	
T6S, R15E	X	
T6S, R16E	X	
T4S, R13E		X
T4S, R17E		X
T5S, R13E		X
T5S, R17E		X

[1] Several technical changes were made at this time including stating the standards in parts per million (ppm) to make the SO_2 NAAQS consistent with those for other pollutants. The former standards, stated in micrograms per cubic meter (ug/m^3), are in parentheses.

[2] Violations of the primary and secondary standards are determined as follows. The annual arithmetic mean of measured hourly ambient SO_2 concentrations must not exceed the level of the annual standard in a calendar year. The 24-hour and 3-hour averages of measured concentrations must not exceed the level of the respective standard more than once per calendar year.

Table 1.1 - Study Area Definition		
Hayden Area Description	**Does Not Meet Primary Standards**	**Cannot Be Classified**
T6S, R13E		X
T6S, R17E		X

Figure 1.1 Hayden SO2 Nonattainment Area

The relationship of major SO_2 point sources and ambient air quality is relatively well-defined. Emissions inventories demonstrate that the smelter, owned and operated by ASARCO, comprises 99 percent of total SO_2 emissions in the nonattainment area (See **Chapter 4**). The primary copper smelter is located near the town of Hayden, Gila County, Arizona; at latitude 33° 00' 29" N and longitude 110° 47' 17" W, at an elevation of 2,050 feet above mean sea level (See **Figure 1.1**).

As required by the Clean Air Act (CAA), Arizona submitted a State Implementation Plan (SIP) for all major sources in the state in 1972. The portion of the SIP pertaining to attainment and maintenance of the NAAQS for SO_2 did not sufficiently define emissions limitations or require permanent control of emissions for existing copper smelters and was, therefore, disapproved on July 27, 1972 (37 FR 15081). On the same date, EPA proposed revised regulations for control of sulfur oxides emitted by all existing smelters in Arizona (37 FR 15096). These regulations were never finalized due to issues regarding the adequacy of the air quality data used to develop the limits. EPA subsequently established an SO_2 monitoring network around each smelter (June 1973 - October 1974) to gather air quality data upon which to base emissions limitations.

EPA and State efforts to develop comprehensive emissions limits continued through the 1970s. In 1977, the State developed rules for the use of Supplementary Control Systems (SCS), whereby, based on ambient monitoring data, the smelters could intermittently curtail emissions to meet the SO_2 NAAQS. EPA disapproved this approach and required installation of continuous SO_2 emissions controls adequate to meet the NAAQS. Consequently, on January 4, 1978, EPA published final emissions limits for the Arizona smelters based on the 1973-1974 air quality data and the use of a proportional rollback model (43 FR 755). These regulations specified an emission rate and compliance test methods for each smelter. The 1977 Clean Air Act Amendments, however, modified smelter control requirements to allow the temporary use of SCS while ultimate SO_2 emission limits were developed and also allowed certain smelters additional time for continuous emissions control technology to be installed. In response to this action, Arizona began development of new regulations and on September 20, 1979, submitted Multi-point Rollback (MPR) rules as a proposed revision to the Arizona SIP.[3]

The use of MPR to establish stack emissions limits in the rules addressed the problem of inherently variable SO_2 emissions from smelting operations by correlating the frequency of emissions at various levels with the probability of violating the ambient standards. This technique, "rolled back" a yearly emission profile to a level protective of the standards. The new regulations also set requirements for analyzing the impact of smelter SO_2 fugitive emissions on ambient air quality and the implementation of any necessary fugitive controls. The Hayden area was subsequently classified by operation of law as nonattainment for the primary SO_2 standards by EPA following the enactment of the 1990 Clean Air Act Amendments. The nonattainment designation became effective on November 15, 1990.

The MPR rules, which established stack emission limits for the smelters, were approved by EPA on January 14, 1983 (48 FR 1717). Following EPA's approval of the rule (and a prior consent decree between EPA, ADEQ and ASARCO (#CIV 81-110-GLO-ACM, dated June 22, 1981)), ASARCO began implementation of improved control technology. The improvements included replacement of 12 multiple-hearth roasters and 2 reverberatory furnaces with a new INCO flash smelting furnace, installation of a 650 ton per day oxygen plant to enrich process gases, and a new double-contact acid plant for treatment of process gas SO_2. These controls significantly reduced

[3] Arizona Code of Rules and Regulations (ACRR): Rule (R)9-3-515 (recodified as Arizona Administrative Code (AAC) R18-2-715, Standards of Performance for Existing Primary Copper Smelters; Site-specific Requirements)

emissions and allowed the smelter to come into compliance with the emissions limits in the MPR rules. The Hayden smelter came into full compliance with the MPR regulations in 1984.

On April 11, 1996, ASARCO submitted to the Arizona Department of Environmental Quality the results of an SO_2 fugitive emissions study to fulfill outstanding SIP commitments for analysis of fugitive emissions. Subsequently, in 2001/2002 ASARCO conducted a further ambient impact analysis of maximum actual emissions (including both stack and fugitive) in relation to resulting ambient concentrations. Based on this analysis, a 2002 rulemaking is in the final stages. The revisions to AAC R18-2-715 and R18-2-715.01 include stack emissions limits and fugitive emission limits (See **Appendix A**). The new limits provide a considerable margin of safety to ensure protection of the SO_2 NAAQS throughout the maintenance period to 2015, thus allowing the state to request the area be redesignated to attainment for SO_2.

1.3 Physical, Demographic, and Economic Description of the Hayden Area

1.3.1 Climate and Physiography

Both desert terrain and mountain ranges are found across the southern Gila County and eastern Pinal County landscape. Elevations range from near 1,800 to more than 4,400 feet above sea level in the nonattainment area with the town of Hayden situated at an elevation near 2,050 feet. This unique environment experiences both warm desert and cool alpine climates. In Hayden, the hottest month of the year is July, when the average daily maximum temperature is near 98^o Fahrenheit (F). January is the coolest month with an average daily minimum temperature of 38^o F.

Precipitation generally occurs in two seasons. The wettest month in Hayden is August when monsoonal thunderstorms produce an average monthly total of 2.31" (inches) of rain. Pacific winter storms moving across the area in December produce an average of 1.28" monthly precipitation in the form of rain or snow. The driest month is June, with an average of 0.25" of rain. The average yearly precipitation is 12.50".

1.3.2 Population

Hayden is located in the southern part of Gila County on state highway 177, 35 miles south of Globe, the county seat, and 30 miles southeast of Superior.[4] Since most of the nonattainment area is geographically located in Pinal County, population data for Pinal County are included.

Decennial census data for Hayden, Winkelman, Kearny, Dudleyville CDP, Gila County, and Pinal County are shown in Table 1.2.[5] During the 1970s when rural counties outpaced the growth of urban counties in the U.S., Gila and Pinal Counties grew by 26.7 percent and 32.6 percent, respectively. Although Gila County's population growth slowed during the 1980s, its rate of growth was 27.7 percent during the 1990s. Pinal County's population growth declined only slightly during the 1980s, and during the 1990s, its 54.4 percent growth rate was about double Gila County's growth rate.

In contrast to the decennial census population growth of these counties, Hayden, Winkelman, and Kearny lost population between 1970 and 2000. The greatest population declines occurred

4 Hayden was founded in 1909 by Hayden, Stove and Company that operated nearby mines.

5 Hayden and Winkelman are located in Gila County. Kearny, and Dudleyville are located in Pinal County.

during the 1980s. It appears that the population losses are associated with declining mining sector employment and associated activities, as well as amenities of other geographical locations pulling residents away from these places.

Table 1.2 - Decennial Census Population of Hayden, Winkelman, Kearny, Dudleyville CDP, Gila County, and Pinal County: 1970-2000				
Year	**April 1, 1970**	**April 1, 1980**	**April 1, 1990**	**April 1, 2000**
Hayden	1,283	1,205	909	892
Hayden's decennial change		-6.1%	-24.6%	-1.9%
Winkelman	974	1,060	676	443
Winkelman's decennial change		8.8%	-36.2%	-34.5%
Gila County	29,255	37,080	41,216	51,335
Gila County's decennial change		26.7%	8.5%	27.7%
Dudleyville CDP[6]				1,323
Dudleyville's decennial change				
Kearny	2,829	2,646	2,262	2,249
Kearny's decennial change		-6.5%	-14.5%	-0.6%
Pinal County	68,579	90,918	116,397	179,727
Pinal's decennial change		32.6%	28.0%	54.4%

Source: U.S. Bureau of the Census, decennial census counts.

The DES population projections are the official statistics for the State and differ slightly from the 2000 Census population counts. Table 1.3 portrays the projected growth of Hayden, Winkelman, Kearny, and Dudleyville, as well as Gila County and Pinal County in five-year increments from 2000 to 2015. The population of Hayden is projected to be flat during this time period, compared to Gila County's projected growth rate of 18.5 percent and Pinal County's projected growth rate of 33.8 percent during this 15-year time period. With the exception of Winkelman, the populations of places shown in Tables 1.2 and 1.3 were over projected by ADES while Gila and Pinal Counties were under projected by ADES from the census counts.

[6] Dudleyville is a Census Designated Place (CDP). CDPs represent the statistical counterpart of incorporated places. However, no population data are available for Dudleyville for 1970, 1980, or 1990.

Table 1.3 - Population Projections for Hayden, Winkelman, Kearny, Dudleyville, Gila County, and Pinal County: 2000-2015				
Year	**July 1, 2000**	**July 1, 2005**	**July 1, 2010**	**July 1, 2015**
Hayden	911	911	912	912
Winkelman	419	420	422	423
Gila County	48,614	51,644	54,603	57,613
Kearny	2,610	2,762	2,903	3,030
Dudleyville CDP	1,970	2,095	2,210	2,313
Pinal County	161,630	181,487	199,715	216,215

Source: Arizona Department of Economic Security, August 1, 1997.

1.3.3 Economy

Pinal County was created in 1875 from portions of Maricopa and Pima Counties by the eighth territorial legislature. The county covers 5,371 square miles. The State of Arizona is the county's largest landholder with 35.3 percent of the land area. Individual and corporate ownership accounts for 25.7 percent. Indian reservations cover 20.3 percent; the U.S. Forest Service and Bureau of Land Management hold 17.5 percent; and other public lands comprise the remaining 1.2 percent. Gila County, covering 4,752 square miles, was created in 1881 from portions of Maricopa and Pinal Counties. The U.S. Forest Service is the largest landholder in Gila County accounting for 56 percent of the land area. Indian reservations cover thirty-seven percent; individual and corporate ownership accounts for three percent; the U.S. Bureau of Land Management holds two percent; and the State of Arizona and other public lands comprise the remaining two percent.

Tables 1.4 and 1.5 contain employment, expressed as percentages of total non-farm employees, for Pinal and Gila Counties for 1994, 1997, and 2000. These tables also include labor force data, and are included to demonstrate the decline in mining and quarrying activities and the relatively consistent proportions of the other economic activities in the county.

The economy of the Hayden area is based almost exclusively on copper mining and smelting, but does include some ranching, government, and tourism. Due to cyclical copper prices, the area's economy is in transition. The Kennecott operation in Hayden, which reduced ores from the nearby Ray Mine, ceased operating in 1982. The ASARCO smelter and Hayden concentrator remain in operation. Despite this, the major category of employment remains the mining and smelting industry. The community is also diversifying its economic base to facilitate tourism and retirement needs. Table 1.6 shows a selected time series of civilian labor force data for Hayden.

As noted in Section 1.3.2, minimal population growth is expected between 2000 and 2015 for the Hayden and Winkelman area. During this same time period, however, Kearny's population is projected to grow by about nine percent and Dudleyville CDP's population by seventeen percent. This indicates that additional housing units potentially would need to be constructed for both of these places. Part of the projected population growth could be absorbed by vacant housing units (9.4 percent vacant in Kearny

Table 1.4 - Economic Activity in Pinal County 1994, 1997, and 2000			
Economic activity	**1994**	**1997**	**2000**
Civilian labor force	48,950	54,450	59,425
Unemployment	2,800	2,725	2,475
Unemployment rate	5.7%	5.0%	4.2%
Total employment	46,150	51,725	56,950
Non-farm employment	36,100	39,775	36,525
Mining and quarrying	10.8%	13.1%	3.7%
Construction	3.3%	4.5%	3.8%
Manufacturing	11.9%	7.6%	8.6%
Transportation, Communication, and Public Utilities (TCPU)	1.9%	2.0%	2.3%
Trade	19.9%	19.0%	21.0%
Finance, Insurance, and Real Estate (FIRE)	1.7%	2.1%	2.3%
Services and misc.	16.1%	18.1%	20.3%
Government	33.2%	33.2%	38.0%

Source: Derived from Arizona Department of Economic Security data. Totals may not add to 100 percent.

Table 1.5 - Economic Activity in Gila County 1994, 1997, and 2000			
Economic activity	**1994**	**1997**	**2000**
Civilian labor force	17,658	18,450	17,175
Unemployment	1,575	1,450	1,000
Unemployment rate	8.6%	7.9%	5.8%
Total employment	16,575	17,000	16,175
Non-farm employment	13,100	14,350	14,225
Mining and quarrying	6.9%	2.3 %	4.9 %
Construction	6.1%	6.3 %	7.4 %
Manufacturing	12.2%	11.7 %	7.6 %
Trans., Communication and Pub. Utilities	3.1 %	3.7 %	3.5 %
Trade	23.7 %	24.4 %	23.4 %
Finance, Insurance and Real Estate	2.3 %	1.6 %	1.9 %
Services and misc.	20.6 %	19.5 %	18.1 %
Government	22.9 %	30.7 %	33.2 %

Source: Derived from Arizona Department of Economic Security data. Totals may not add to 100 percent.

Table 1.6 - Civilian Labor Force Data for Hayden: Selected Years			
Year	**1990**	**1998**	**1999**
Civilian labor force	306	290	288
Number Unemployed	36	29	28
Unemployment rate	11.8%	10.0%	9.7%

Source: Arizona Department of Commerce, Community Profiles, February, 2001.

and 20.6 percent vacant in Dudleyville CDP).[7] Most growth, if any, in Hayden and Winkelman could be accommodated by future residents occupying vacant housing units.[8] If additional growth does occur as projected, and additional housing units must be constructed in these places, this would generate associated jobs and activities in these local economies.

1.4 General SIP Approach

In November 1990, the United States Congress enacted a series of amendments to the Clean Air Act (CAA) intended to improve air quality across the nation. One of the primary goals of this comprehensive revision to the CAA was to expand and clarify the planning provisions for those areas not currently meeting the NAAQS. The CAA as amended identifies specific emission reduction goals, requires both a demonstration of reasonable further progress and attainment, and incorporates more stringent sanctions for failure to attain or to meet interim milestones.

CAA, Title I, Part A, and Title I Part D, Subparts 1 and 5 are applicable to this SIP and maintenance plan. Sections 172, 175(A), 191, and 192 set forth the following requirements for SO_2 nonattainment areas:

1.4.1 CAA Section 172(c), Nonattainment Plan Provisions

172(c)(1) - In General: implementation of all reasonably available control measures (RACM) as expeditiously as practicable (including such reductions in emissions for existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology (RACT)) and provide for attainment of the national primary ambient air quality standards.

The ASARCO smelter, the primary source of SO_2 emissions in the Hayden nonattainment area, succeeded in implementing RACM/RACT at the smelter sufficient to attain the NAAQS for SO_2 and went beyond the required technology to increase the facility's efficiency in capturing and treating SO_2. RACT for SO_2 emission controls for a flash smelting furnace include:

[7] The 2000 Census shows Kearny with 873 housing units of which 791 occupied, and Dudleyville CDP with 572 housing units of which 454 are occupied. The number of occupied housing units equals the number of households. Persons per household varies from 2.84 in Kearny to 2.91 in Dudleyville.

[8] The 2000 Census shows Hayden with 334 housing units of which 288 are occupied, Winkelman with 194 housing units of which 160 are occupied. The number of occupied housing units equals the number of households. Persons per household varies from 3.1 in Hayden to 2.77 in Winkelman.

1. Dust Collection Equipment (removes dust for better gas treatment),
2. Wet Gas Handling System,
3. Minimization of Leaks,
4. Hooding and venting of gases to the stack, and
5. Contact Sulfuric Acid Plant.

Chapter 6 contains further explanation of applicable RACM/RACT for the ASARCO smelting facility and other SO_2 point sources in the nonattainment area.

172(c)(2) - Reasonable Further Progress (RFP): plan provisions shall demonstrate reasonable further progress such that annual incremental reductions in emissions ensure attainment of the national ambient air quality standards by the applicable date.

This submittal demonstrates that the Hayden nonattainment area has attained and will maintain the SO_2 NAAQS with current control measures (See **Chapter 6**).

172(c)(3) - Inventory: the plan shall include a comprehensive inventory of actual emissions from all sources of relevant pollutant(s).

ADEQ maintains a historical and current database of actual emissions from State-permitted point and area sources. The Pinal County Air Quality Control District maintains a similar database of actual emissions from County-permitted sources. All non-permitted source emissions data (i.e.: mobile sources) come from EPA's national emissions inventory.[9] Base-year 2000 emissions and projected 2015 emissions are contained in **Chapter 4**.

172(c)(5) - Permits for New and Modified Major Stationary Sources: the plan shall require permits for the construction and operation of new and modified major stationary sources throughout the nonattainment area.

All new sources and modifications to existing sources in Arizona are subject to state requirements for preconstruction review and permitting pursuant to Arizona Administrative Code (AAC), Title 18, Chapter 2, Articles 1 through 5. All new major sources and modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules or Prevention of Significant Deterioration (PSD) for maintenance areas. The State NSR program was conditionally approved by EPA in 1992, and is pending final approval. It should be noted that ADEQ currently has full approval of its Title V permit program.

172(c)(6) - Other Measures: the Plan shall include enforceable emissions limitations and such other control measures, means or techniques, as well as schedule and timetables for compliance, as may be necessary or appropriate to provide for attainment of such standard in such area by the applicable attainment date.

AAC R18-2-715 contains the required annual average emission limitations and number of three-hour average emission limits for the ASARCO smelter. AAC R18-715.01 (Standards of Performance for Existing Primary Copper Smelters; Compliance and Monitoring), set forth the compliance date of January 14, 1986, for monitoring, calibration, measurement system performance requirements, record keeping, bypass operation, and issuance of notices of violation.[10] Details

[9] AIR*Data* provides access to air pollution data for the entire United States and can be found at: http://www.epa.gov/air/data/index.html

[10] Standards of Performance for Existing Primary Copper Smelters; Site-specific Requirements, AAC R18-2-515, renumbered AAC R18-2-715 (1993).

regarding emissions limitations and control measures for all SO_2 sources in the nonattainment area may be found in **Chapter 4**.

172(c)(7) - Compliance with Section 110(a)(2): the Plan shall be in compliance with Section 110 (a)(2) (Implementation Plans) of CAA.

Section 110(a)(2)(A) of CAA requires that states provide for enforceable emission limitations and other control measures, means, or techniques, as well as schedules for compliance. **Chapter 4** includes the list of control measures utilized to bring this area into attainment and future maintenance of the SO_2 NAAQS.

Section 110(a)(2)(B) of CAA requires that states provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor, compile, and analyze data on ambient air quality. Under ADEQ's air quality assessment program, ambient monitoring networks for air quality are established to sample pollution in a variety of representative settings, to assess the health and welfare impacts and to assist in determining air pollution sources. The monitoring sites are combined into networks, operated by a number of government agencies and regulated companies. Each network is comprised of one or more monitoring sites, whose data are compared to the NAAQS, as well as statistically analyzed in a variety of ways. The agency or company operating a monitoring network also tracks data recovery, quality control, and quality assurance parameters for the instruments operated at their various sites.

The collected data are summarized into the appropriate quarterly or annual averages. The samplers are certified by Federal Reference or Equivalent Methods. Regular checks of the stability, reproducibility, precision, and accuracy of the samplers and laboratory procedures are conducted by either the agency or company network operators. The protocol for SO_2 monitoring used by the State, local agencies, and companies was established by EPA in the following sections of the Code of Federal Regulations (CFR):

1. 40 CFR Part 50, Appendix A, Reference Method for the Determination of Sulfur Dioxide in the Atmosphere;
2. 40 CFR Part 53, Subpart B, Procedures for Testing Performance Characteristics of Automated Methods for SO_2, CO, O_3, and NO_2; and
3. 40 CFR Part 58, Subpart A, B, and C, Ambient Air Quality Surveillance.

Section 110 (a)(2)(C), Section 110 (a)(2)(E), Section 110 (a)(2)(F), and Section 110 (a)(2)(L) of CAA require states to have permitting, compliance, and source reporting authority. Arizona Revised Statutes (ARS) § 49-402 establishes ADEQ's permitting and enforcement authority. As authorized under ARS 49-402, ADEQ retains adequate funding and employs adequate personnel to administer the air quality program. **Appendix A** includes organization charts for ADEQ's Air Quality Division.

Under ADEQ's air permits program, stationary sources that emit regulated pollutants are required to obtain a permit before constructing, changing, replacing, or operating any equipment or process which may cause air pollution. This includes equipment designed to reduce air pollution. Permits are also required if an existing business that causes air pollution transfers ownership, relocates, or otherwise changes operations. Additionally, ADEQ is responsible for assessing fees based on the actual emissions submitted in the emission inventory for all sources under ADEQ jurisdiction pursuant to AAC R18-2-326.

Rule R18-2-327 requires that any source subject to a permit must complete and submit to the Director their responses to an annual emissions inventory questionnaire. A current air pollutant emissions inventory of both permitted and non-permitted sources within the state is necessary to properly evaluate the air quality program effectiveness, as well as determine appropriate emission fees. ADEQ is responsible for the preparation and submittal of an emissions inventory report to EPA for sources and emission points prescribed in 40 CFR 51.322, and for sources that require a permit under ARS §49-426 for criteria pollutants. This inventory encompasses those sources under state jurisdiction emitting 1 ton per year or more of any individual regulated air pollutant, or 2.5 tons per year (tpy) or more of any combination of regulated air pollutants.[11]

Under ADEQ's air quality compliance program, major sources are inspected annually. ADEQ's Air Compliance Section implements compliance assistance initiatives to address non-compliance issues (i.e., seminars and workshops for the regulated community explaining the general permit requirements, individual inspections of all portable sources within a geographical area, mailings, etc.). In addition, compliance initiatives are developed to address upcoming or future requirements (i.e., new general permits) and include such actions as training for inspectors; development of checklists and other inspection tools for inspectors; public education workshops; targeted inspections; mailings, etc. ADEQ's Air Compliance Section also has an internal performance measure to respond to all complaints as soon as possible, but within a minimum of five working days.

Section 110(a)(2)(G) of CAA requires that states provide for authority to establish emergency powers and authority and contingency measures to prevent imminent endangerment. AAC R18-2-220 prescribes the procedures the Director of ADEQ shall implement in order to prevent the occurrence of ambient air pollution concentrations which would cause significant harm to the public health. As authorized by ARS §49-426.07, ADEQ may seek injunctive relief upon receipt of evidence that a source or combination of sources is presenting an imminent and substantial endangerment to public health or the environment.

172(c)(8) - Equivalent Techniques: the Plan may use equivalent techniques such as equivalent modeling, emission inventory, and planning procedures allowed by the Administrator, upon application by any state.

In 1983, EPA approved Multi-point Rollback modeling to establish emissions limits for the ASARCO Hayden smelter, and the limits were updated in 2002 as part of the current SIP process. Modeling for the fugitive emissions study at this facility was conducted with models from EPA's "Guideline on Air Quality Models."

172(c)(9) - Contingency Measures: the Plan shall provide for the implementation of specific measures to take effect without further action by the state or the Administrator in the event the area fails to make reasonable further progress (RFP) or to attain the primary national ambient air quality standards (NAAQS).

As noted in 172(c)(2) above, this submittal includes monitoring data and source permit information that demonstrate that the applicable area has attained, and will maintain, the SO_2 NAAQS with control measures currently fully implemented. As such, the RFP requirement is met.

1.4.2 CAA Section 175(A) - Maintenance Plans

[11] "Regulated air pollutant" is defined in AAC R18-2-101 as any of the following: (a) Any conventional air pollutant as defined in ARS §49-401.01; (b) Nitrogen oxides and volatile organic compounds; (c) Any air contaminant that is subject to a standard contained in Article 9 of Chapter 2; (d) Any hazardous air pollutant as defined in ARS §49-401.01; (e) Any Class I or II substance listed in Section 602 of the Act.

175(A)(a) - Plan Revisions: each state which submits a request for redesignation of a nonattainment area shall also submit a revision of the applicable SIP to provide for the maintenance of the NAAQS for at least ten years after the redesignation.

As documented in **Chapter 7**, this submittal shows attainment through 2015.

175(A)(b) - Subsequent Plan Revisions: eight years after redesignation as an attainment area, the State shall submit an additional revision of the applicable SIP for maintaining the NAAQS for 10 years after the expiration of the 10-year period referred to in subsection (a).

ADEQ commits to submit an additional SIP revision eight years after redesignation.

175(A)(c) - Nonattainment Requirements Applicable Pending Plan Approval: until such plan revision is approved and an area is redesignated as attainment for any area designated nonattainment, the requirements of this part shall continue in force and effect.

ADEQ commits to keeping all applicable measures in place.

175(A)(d) - Contingency Provisions: each plan revision submitted under this section shall contain such contingency provisions to assure that the State will promptly correct any violation of the standard which occurs after the redesignation of the area as an attainment area. Such provisions shall include a requirement that the State will implement all measures with respect to the control of the air pollutant concerned before redesignation.

ADEQ commits to implementing all identified measures as necessary (See **Chapter 7**).

1.4.3 CAA Section 191 and 192 - Plan Submission and Attainment Dates

This document fulfills all outstanding implementation plan requirements for the Hayden SO_2 nonattainment area. With the submittal of this SIP and Maintenance Plan, ADEQ requests redesignation of the Hayden nonattainment area to attainment.

1.4.4 Conformity Provisions

Section 176(c)(1)(A) of CAA requires SIPs to contain information regarding the State's compliance with conformity requirements. As stated in 40 CFR 93.153(a), "Conformity determinations for Federal actions related to transportation plans, programs and projects developed, funded, or approved under title 23 U.S.C. or the Federal Transit Act (40 U.S.C. 1601 et seq.) must meet the procedures and criteria of 40 CFR part 51, subpart T, in lieu of the procedures set for in this subpart." 40 CFR 93.103(b) waives transportation conformity for SO_2 nonattainment areas, but general conformity for the Hayden, Gila/Pinal County area must still be addressed to assure SO_2 emissions from any Federal actions or plans do not exceed the rates outlined in 40 CFR 93.153(b)(1) for nonattainment areas or 40 CFR 93.153(b)(2) for maintenance areas. Criteria for making determinations and provisions for general conformity as outlined in 40 CFR 93.153 can be located in R18-2-1438 of the Arizona Administrative Code. There are no federal plans or actions affecting air quality currently in the Hayden, Gila/Pinal County area, nor are any foreseen through the year 2015.

2.0 COMPLIANCE WITH OTHER FEDERAL REGULATIONS

The provisions of 40 CFR 60 Subpart P (§§60.160 - 60.166) Standards of Performance for Primary Copper Smelters [12] are applicable to dryer, roaster, smelting furnace, and copper converter equipment in primary copper smelters. Any facility that commences construction or modification after October 16, 1974, is subject to the requirements of this subpart. The Hayden smelter was modified in 1983 when an Inco Flash Furnace, oxygen plant, and #2 acid plant were installed. ADEQ compliance, permit, monitoring, technical, and correspondence files indicate that the facility has complied with all the requirements of this subpart.

[12] Source: 41 FR 2338, Jan. 15, 1976, unless otherwise noted.

3.0 SO_2 MONITORING NETWORK

Monitoring began in the Hayden area in 1970 by the State of Arizona.[13] ASARCO began continuous ambient SO_2 air quality monitoring in the Hayden area in 1974. Since that time, an extensive monitoring network was established with sufficient spatial and temporal coverage to comprehensively evaluate the ambient impact of smelter emissions. More than twenty stationary and mobile monitoring sites were established throughout the area with as many as twelve monitors operating concurrently (See **Table 3.1** and **Figure 3.1**).[14] This ambient SO_2 network, comprised of EPA, State, and ASARCO monitors, was developed as the result of extensive efforts to identify maximum ambient impact areas using diffusion modeling, monitored atmospheric dispersion parameters, citizen observations, and ambient SO_2 monitoring.

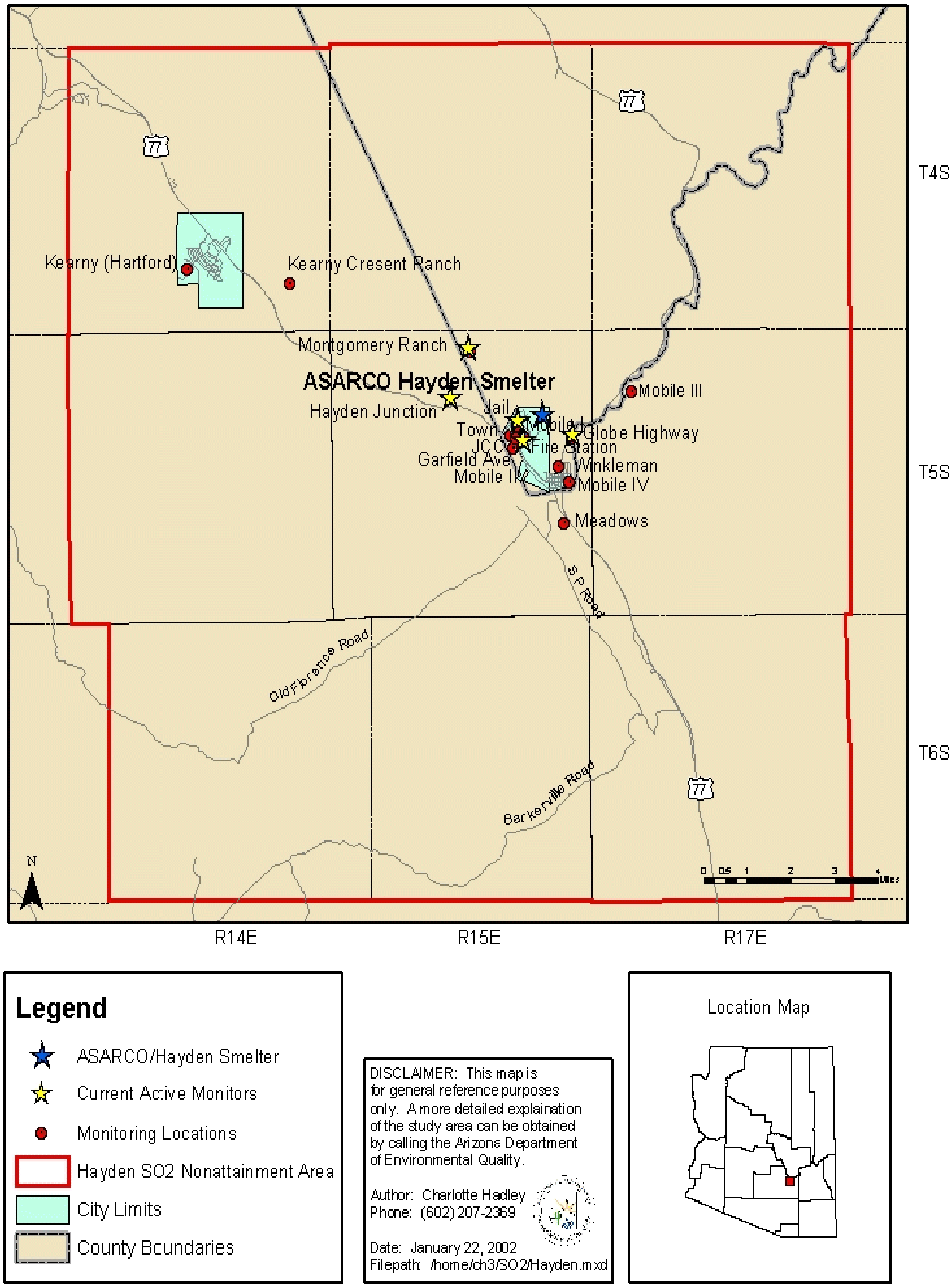
Table 3.1 - Ambient Monitoring Network

Monitor Site	Period of Operation	Monitor Site	Period of Operation
Town	1970-1975, 1978-1979	Winkleman School	1980-1988
Garfield Avenue	1980-present	Meadows	1974-1979, 1981-1988
Fire Station	1975-1977, 1979-1981	Kearny Crescent Ranch	1974-1981
Jail	1982-present	Kearny Hartford	1974-1979
Jail (state)	1974, 1976-present	Mobile I	1978
Hayden Junction	1974-present	Mobile II	1979-1980
Junction North	1976-1977	Mobile III	1980
Montgomery Ranch	1974-present	Mobile IV	1982
Montgomery Ranch (state)	1974-1984	EPA	1973-1974
Globe Hwy.	1978-present	4th Avenue	1994-1995
Winkleman	1974-1979		

[13] *Sulfur Dioxide Monitoring Network Study*, Arizona State Department of Health, Environmental Health Services, Division of Air Pollution Control, 1974.

[14] Protocols for SO_2 monitoring established by EPA are found in 40 CFR Part 50, Appendix A, *Reference Method for the Determination of Sulfur Dioxide in the Atmosphere,* Part 58, Subpart B, §58.14, *Special Purpose Monitors,* Subpart C, §58.20, *State and Local Air Monitoring Stations, Air Quality Surveillance: Plan Content,* and Subpart D, §58.30, *National Air Monitoring Stations (NAMS).*

Figure 3.1 Hayden SO2 Nonattainment Area Monitor Locations



Installation of additional meteorological instrumentation at the network sites, measuring wind speed and direction, temperature, and humidity parameters helped to further define airflow and pollutant transport in the region. Utilization of mobile monitors allowed evaluation and verification of ambient SO_2 concentrations over a greater area. Numerous sites were monitored and subsequently relocated under the direction of state meteorologists when no significant impacts were observed. All monitoring for SO_2 was performed with guidance and dispersion modeling analysis from the Arizona Department of Health Services, Bureau of Air Quality Control.

The monitoring network was also developed in accordance with Supplementary Control Systems (SCS). Prior to implementation of continuous control technology, SCS utilized analysis of atmospheric conditions and monitored ambient concentrations to vary the rate of smelter emissions to avoid any exceedance of the NAAQS. In 1977, the state adopted rules that codified requirements for concurrent operation of at least eight ambient monitors, including a mobile monitor placed at points representative of observed maximum concentrations. Relocation of a stationary monitor was allowed only when:

1. There were no ambient SO_2 violations recorded;
2. No SCS curtailment actions were implemented due to data recorded at that monitor;
3. The foregoing conditions were due to implementation of improved emissions control techniques or other permanent modifications; and
4. A new site was shown to be more representative of the ambient air quality of the area.

Historic ambient SO_2 monitoring site locations and periods of operation are provided in Table 3.1, and Figure 3.1 and 3.2.

Further refinement of the monitoring network was required by the adoption of the MPR rule that established stack emissions limits for the smelter in 1979 based on permanent controls. Placement of additional monitors were established with EPA to further evaluate ambient impacts.

Following ASARCO's compliance with emissions limits as defined in AAC R18-2-715(F), and based on continuous control technology, the number of permanent monitors was gradually reduced to the current network of six. These are all high impact ambient monitoring sites found to be representative of air quality for the area. These monitoring site decisions were made by ADEQ and ASARCO, and are in accordance with EPA guidance (See **Table 3.2**).

3.1 Current Sampler Type and Siting

The five monitoring units operated by ASARCO are Thermo Environmental Instruments (TEI) pulsed fluorescence Model 43 SO_2 analyzers. All of these SO_2 analyzers are interfaced to ASARCO's data acquisition system. The TEI analyzers measure in the 0-2 ppm range. Redundant recording systems are operated for all of the ASARCO analyzers. The samplers are connected to strip chart recorders for backup and analyzed by planimeter as necessary for validation of recorded concentrations. The ADEQ SO_2 analyzer is a Thermo pulse fluorescence analyzer (model 43 C), measuring in the 0-2 ppm range (**Figure 3.2** illustrates the current monitor locations and proximity to the Hayden smelter). The ASARCO and ADEQ monitors are operated and maintained in accordance with federal regulations as described in 40 CFR parts 58.13 and 58.22 as well as Appendices A and E of part 58.

Figure 3.2 Hayden SO2 Nonattainment Area
Magnification of Monitoring Locations

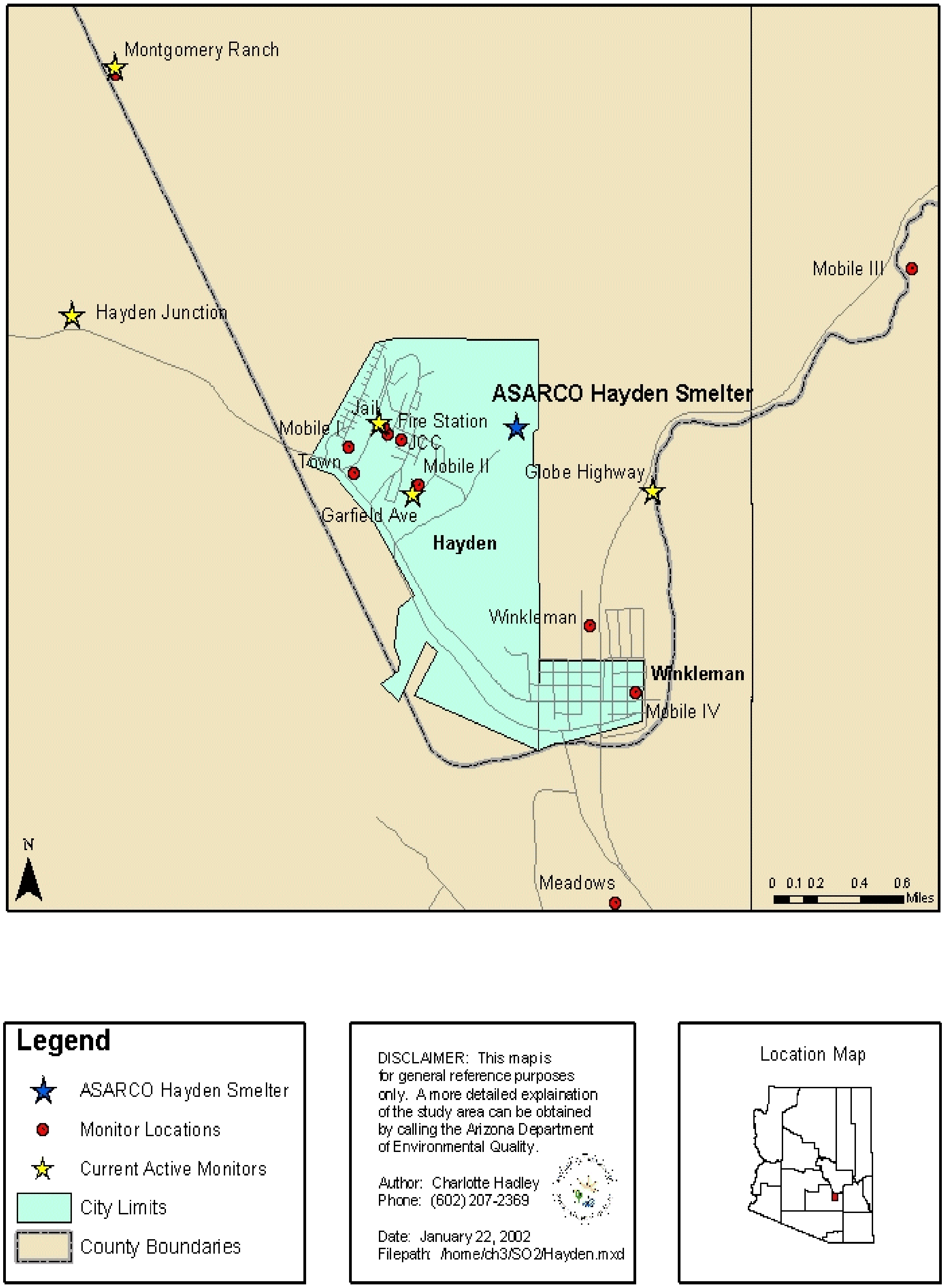


Table 3.2 - Current Monitoring Network			
Unit[15]	**Location**	**Elevation (feet above sea level)**	**Operator**
Montgomery Ranch[16]	2.50 miles NW from ASARCO	2354	ASARCO
Jail	0.57 miles W from ASARCO	2052	ASARCO
Jail (State)	0.57 miles W from ASARCO	2052	ADEQ
Hayden Junction	2.12 miles W from ASARCO	1932	ASARCO
Garfield Ave.	0.56 miles SW from ASARCO	2040	ASARCO
Globe Hwy.	0.61 miles E from ASARCO	1964	ASARCO

3.2 Ambient Data Analysis

A review of the SO_2 monitoring data in the Hayden nonattainment area verifies that:

1. There have been no recorded exceedances of the annual NAAQS for SO_2 since 1982 and annual averages are generally 53 percent of the NAAQS;
2. There have been no recorded exceedances of the 24-hour NAAQS for SO_2 since 1994 and maximum 24-hour average SO_2 levels are generally 76 percent of the NAAQS; and,
3. There have been no recorded exceedances of the 3-hour NAAQS for SO_2 since 1994 and maximum 3-hour averages are generally below 80 percent of the NAAQS.

The nonattainment area has recorded more than eight consecutive quarters of quality assured, violation-free data from July 1999 through June 2001. Data for the current monitoring network is presented in Table 3.3.

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	**Annual Ave.**	**24-Hr Max**	**3-Hr Max**	**Number of Exceedances of the Standard**			**No. of 1-hr. Samples**
				Annual (80 ($\mu g/m^3$)	**24-hr. (365 $\mu g/m^3$)**	**3-hr. (1300 $\mu g/m^3$)**	
Montgomery Ranch							
2001	45	184	685	0	0	0	8710
2000	41	210	799	0	0	0	8767
1999	45	231	1013	0	0	0	8761

[15] The Garfield, Jail, Hayden Junction, and Globe Highway monitors are primarily fugitive emissions impact sites. Montgomery Ranch is a mixed stack and fugitive impact site.

[16] Ambient sulfur dioxide monitoring at Montgomery Ranch began in 1974. This monitor was the "limiting site" for the original MPR analysis ("*Ultimate Sulfur Dioxide Limits for Arizona Copper Smelters,*" Moyers and Peterson, September 14, 1979).

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	Annual Ave.	24-Hr Max	3-Hr Max	Number of Exceedances of the Standard			No. of 1-hr. Samples
				Annual (80 ($\mu g/m^3$)	24-hr. (365 $\mu g/m^3$)	3-hr. (1300 $\mu g/m^3$)	
Montgomery Ranch con't							
1998	41	186	768	0	0	0	8325
1997	40	239	645	0	0	0	8199
1996	47	286	1170	0	0	0	8442
1995	52	256	950	0	0	0	8407
1994	36	180	1096	0	0	0	8649
1993	25	143	792	0	0	0	8756
1992	41	193	626	0	0	0	8726
1991	44	243	831	0	0	0	8721
1990	41	187	692	0	0	0	8704
1989	55	413	2125	0	2	2	7764
1988	42	405	1187	0	1	0	8560
1987	45	301	1297	0	0	0	8586
1986	34	242	1183	0	0	0	8505
1985	25	141	803	0	0	0	8564
1984	21	245	688	0	0	0	8640
1983	44	191	928	0	0	0	8592
1982	84	414	1123	1	2	0	8367
1981	139	498	2283	1	7	7	8651
1980	93	742	3781	1	5	9	8602
1979	158	1383	9287	1	9	13	8648
1978	133	395	1785	1	2	2	8718
1977	180	772	2384	1	2	2	8724
1976	183	1058	3275	1	2	2	8443
1975	184	1576	6491	1	2	2	8204
1974	262	1442	4848	1	2	2	7593
Jail							
2001	21	152	877	0	0	0	8759

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	**Annual Ave.**	**24-Hr Max**	**3-Hr Max**	**Number of Exceedances of the Standard**			**No. of 1-hr. Samples**
				Annual (80 ($\mu g/m^3$)	**24-hr. (365 $\mu g/m^3$)**	**3-hr. (1300 $\mu g/m^3$)**	
Jail con't							
2000	13	63	342	0	0	0	8783
1999	14	89	432	0	0	0	8748
1998	13	110	647	0	0	0	8392
1997	15	127	584	0	0	0	8401
1996	20	88	529	0	0	0	8428
1995	21	96	393	0	0	0	8602
1994	16	70	444	0	0	0	8758
1993	10	64	335	0	0	0	8716
1992	15	71	402	0	0	0	8667
1991	18	89	472	0	0	0	8716
1990	19	163	821	0	0	0	8667
1989	21	223	979	0	0	0	8704
1988	13	122	708	0	0	0	7699
1987	15	237	1235	0	0	0	8552
1986	15	117	697	0	0	0	8655
1985	9	58	346	0	0	0	8561
1984	10	127	620	0	0	0	8688
1983	31	270	1423	0	0	1	8664
Jail (State)							
2001	24	157	785	0	0	0	8407
2000	17	72	322	0	0	0	8106
1999	24	99	475	0	0	0	8015
1998	29	122	595	0	0	0	7457
1997	5	152	697	0	0	0	8456
1996	16	81	527	0	0	0	8618
1995	18	97	435	0	0	0	8531
1994	21	453	464	0	1	0	7444

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	Annual Ave.	24-Hr Max	3-Hr Max	Number of Exceedances of the Standard			No. of 1-hr. Samples
				Annual (80 ($\mu g/m^3$)	24-hr. (365 $\mu g/m^3$)	3-hr. (1300 $\mu g/m^3$)	
Jail (State) con't							
1993	10	84	372	0	0	0	8585
1992	16	238	815	0	0	0	8384
1991	16	81	511	0	0	0	8017
1990	16	199	1137	0	0	0	8129
1989	24	183	697	0	0	0	8636
1988	24	137	800	0	0	0	8553
1987	29	422	1498	0	1	2	8569
1986	24	139	707	0	0	0	8380
1985	19	120	750	0	0	0	8494
1984	22	177	693	0	0	0	8132
1983	36	269	1942	0	0	1	8300
1982	57	417	1724	0	2	5	8522
1981	75	382	2334	0	2	5	8351
1980	45	418	1410	0	1	3	7922
1979	71	1143	4606	0	3	10	8311
1978	60	413	3286	0	1	2	7584
1977	95	619	2525	1	2	2	8223
1976	113	940	3350	1	2	2	8125
1975	105	950	4483	1	2	2	7756
1974	127	1110	4887	1	2	2	7739
Hayden Junction							
2001	14	59	215	0	0	0	8759
2000	13	90	427	0	0	0	8778
1999	13	69	404	0	0	0	8739
1998	9	65	368	0	0	0	8372
1997	12	47	285	0	0	0	8389
1996	9	52	374	0	0	0	8429

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	Annual Ave.	24-Hr Max	3-Hr Max	Number of Exceedances of the Standard			No. of 1-hr. Samples
				Annual (80 ($\mu g/m^3$)	24-hr. (365 $\mu g/m^3$)	3-hr. (1300 $\mu g/m^3$)	
Hayden Junction con't							
1995	13	77	416	0	0	0	8392
1994	14	72	457	0	0	0	8618
1993	6	68	160	0	0	0	8760
1992	7	48	343	0	0	0	8746
1991	10	75	455	0	0	0	8711
1990	9	50	319	0	0	0	8704
1989	10	93	585	0	0	0	7762
1988	8	159	509	0	0	0	8579
1987	14	153	744	0	0	0	8586
1986	11	155	507	0	0	0	8564
1985	10	97	320	0	0	0	8487
1984	5	70	492	0	0	0	8424
1983	21	152	780	0	0	0	8592
1982	36	290	1291	0	0	0	8461
1981	40	322	1491	0	0	1	8461
1980	22	214	1132	0	0	0	8596
1979	43	244	1751	0	0	1	8676
1978	37	215	1118	0	0	0	8711
1977	66	514	3262	0	2	2	8728
1976	57	344	1754	0	0	2	8570
1975	58	360	2146	0	0	2	8632
1974	115	542	2466	1	2	2	7794
1973	191	1091	6225	1	36	61	7008
1972	254	9504	9504	1	2	2	7499
1971	336	2136	7413	1	2	2	2064
1970	481	1877	6970	1	2	2	4906
1969	377	3849	N/A	1	2	2	5011

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	Annual Ave.	24-Hr Max	3-Hr Max	Number of Exceedances of the Standard			No. of 1-hr. Samples
				Annual (80 ($\mu g/m^3$)	24-hr. (365 $\mu g/m^3$)	3-hr. (1300 $\mu g/m^3$)	
Garfield Avenue							
2001	29	285	873	0	0	0	8760
2000	21	284	860	0	0	0	8784
1999	25	313	583	0	0	0	8753
1998	20	237	770	0	0	0	8395
1997	22	283	521	0	0	0	8427
1996	22	336	796	0	0	0	8452
1995	23	195	1125	0	0	0	8464
1994	22	268	633	0	0	0	8617
1993	12	202	432	0	0	0	8758
1992	28	344	866	0	0	0	8764
1991	23	342	1071	0	0	0	8733
1990	23	263	939	0	0	0	8742
1981	45	225	1355	0	0	1	8615
1980	35	214	975	0	0	0	8322
Globe Highway							
2001	43	311	838	0	0	0	8754
2000	38	218	772	0	0	0	8784
1999	35	209	735	0	0	0	8757
1998	32	178	1284	0	0	0	8377
1997	43	315	836	0	0	0	8227
1996	52	226	727	0	0	0	8425
1995	39	233	1084	0	0	0	8395
1994	38	332	1776	0	0	1	8610
1993	29	148	551	0	0	0	8757
1992	28	205	672	0	0	0	8746
1991	40	224	1199	0	0	0	8698
1990	37	292	1153	0	0	0	8707

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	**Annual Ave.**	**24-Hr Max**	**3-Hr Max**	**Number of Exceedances of the Standard**			**No. of 1-hr. Samples**
				Annual (80 ($\mu g/m^3$)	**24-hr. (365 $\mu g/m^3$)**	**3-hr. (1300 $\mu g/m^3$)**	
Globe Highway, con't							
1989	72	*382*	1643	0	1	4	7861
1988	36	345	1595	0	0	1	8674
1987	33	223	1092	0	0	0	8593
1986	40	325	1270	0	0	0	8553
1985	40	283	1556	0	0	1	8594
1984	20	152	537	0	0	0	8730
1983	46	328	1674	0	0	1	8640
1982	73	332	1290	0	0	0	8350
1981	86	302	1269	1	0	0	8350
1980	55	314	1254	0	0	0	8651
1979	113	349	1647	1	0	3	8667
1978	102	404	1482	1	0	2	8713

4.0 SO_2 EMISSIONS INVENTORY FOR POINT, AREA AND MOBILE SOURCES

Emissions inventories from all sources in the Hayden nonattainment area indicate that although there are other sources of SO_2 emissions, the ASARCO smelter is the primary source for SO_2 emissions and comprises more than 99 percent of total SO_2emissions in the area. Data shows that no other point, area or mobile sources have contributed or contribute to the same levels of SO_2 in the Hayden nonattainment area. Emissions units and rates, and derivation of mobile and area source emissions for the nonattainment area are described in Section 4.1 through Section 4.3 below.

4.1 SO_2 Point Sources within the Hayden Nonattainment Area

One point source is located within the Hayden nonattainment area. Point source locations are illustrated in Figure 4.1, on the following page. Attainment year inventories for the source is presented in Table 4.1.[17]

Table 4.1 - Actual SO_2 Emissions for Hayden Nonattainment Area - Point Sources

Source Name:		1999	2000	2001
ASARCO Hayden Smelting Operations[18]	24 Hr.	58 tpd	47 tpd	51 tpd
	Annual	21,081 tpy	15,934 tpy	18,362 tpy
24 Hour Total:		**58 tpd**	**47 tpd**	**51 tpd**
Annual Total:		**21,081 tpy**	**15,934 tpy**	**18,362 tpy**

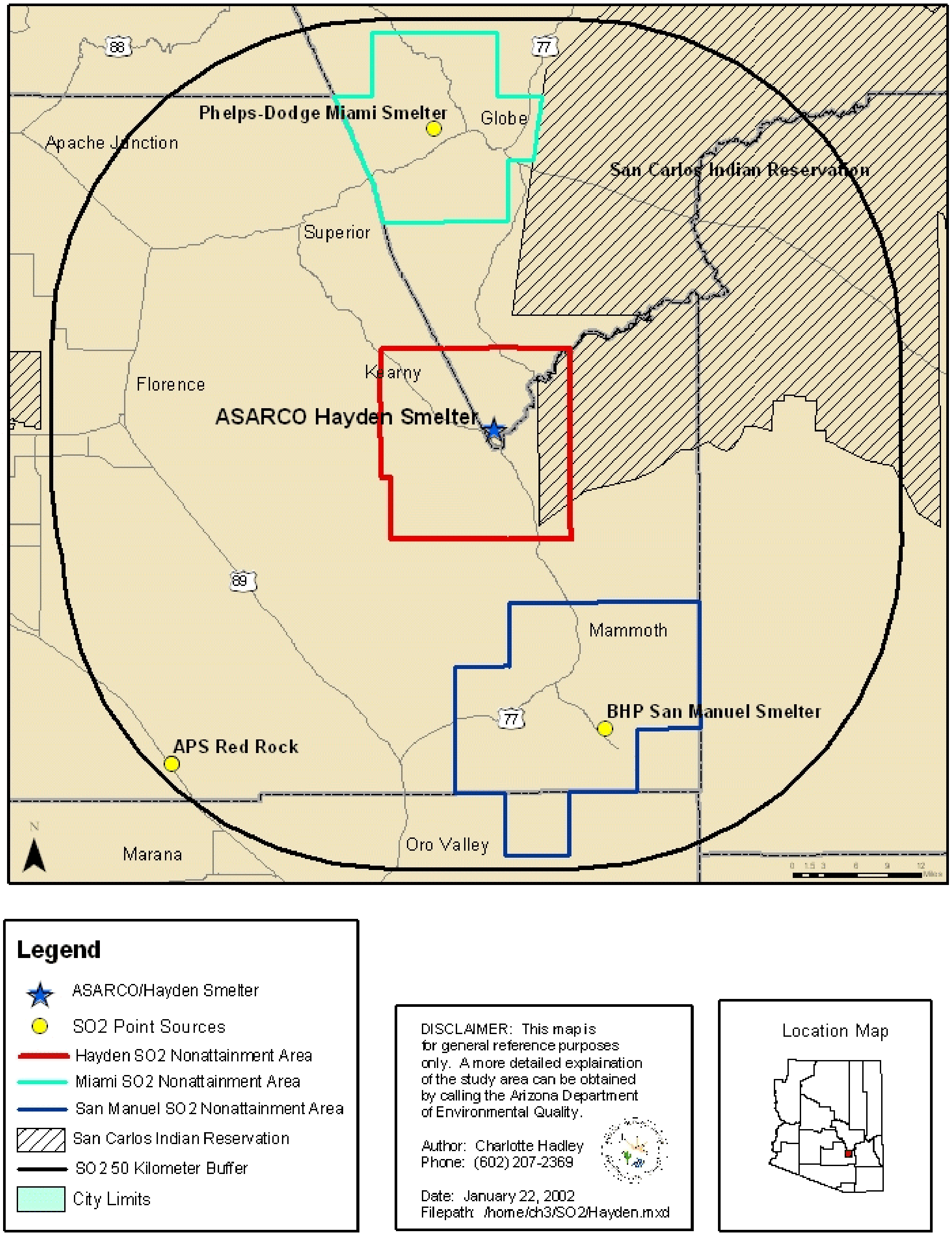
4.1.1 ASARCO Hayden Smelter

Smelting and refining of copper ore at ASARCO's primary copper smelter operations produces anode copper for shipment to facilities in Texas for production of copper cathode as well as the byproduct sulfuric acid for sale to customers. More than 99 percent of all SO_2 emissions in the nonattainment area are generated by this facility. Based on 2000 emissions data, the majority of this facility's emissions are from the following stack and fugitive units: main stack core including primary flash furnace and converter process gas; main stack annulus furnace vent gas and converter secondary gases; and fugitive emissions from the flash furnace, converters, anode furnace, and slag dump. The maximum allowable annual average SO_2 emission rate for stacks was reduced from 9,521 lbs/hr to 6,882 lbs/hr with recent revisions to AAC R18-2-715(F)(2). The revisions also limited annual average fugitive emissions to 295 lbs/hr. The combined limit for the stack and fugitive emissions units is currently 7,177 lbs/hr (31,435 tpy). Additionally, the permit limits sulfur content and usage rates for fuel used in all fuel burning equipment requiring the use of natural gas and low sulfur fuels. Emissions units and rates for the ASARCO smelter are detailed in Appendix B.

[17] Unless otherwise noted, all 24-hour inventories are ton per day (tpd) averages based on the number of operating hours for each respective year.

[18] 24-hour inventories are averages calculated by dividing the annual facility emissions by the number of operating days for each year.

Figure 4.1 Location of All Point Sources Within the Hayden SO2 Nonattainment Area and Major Point Sources Within the 50 Kilometer Buffer



4.2 Major Point Sources within the 50 km Buffer Area

In addition to the sources located within the nonattainment area, there are several SO_2 point sources within 50 kilometers of the Hayden nonattainment area. The emissions from these point sources do not significantly contribute to levels of SO_2 in the nonattainment area. Attainment year inventories are provided in Table 4.2.[19]

Table 4.2 - SO_2 Emissions within 50km of the Hayden Nonattainment Area - Major Point Sources

Source Name:		1999	2000	2001
APS (Red Rock)	24 Hr.	< 1 tpd	< 2 tpd	< 6 tpd
	Annual	8 tpy	153 tpy	497 tpy
BHP San Manuel Smelting Operations[20,21]	24 Hr.	30 tpd	< 1 tpd	< 1 tpd
	Annual	3,622 tpy	<1 tpy	<1 tpy
Phelps-Dodge Miami Smelting Operations[21]	24 Hr.	22 tpd	21 tpd	27 tpd
	Annual	7,819 tpy	6,810 tpy	9,062 tpy
24 Hour Total:		**< 53 tpd**	**< 24 tpd**	**< 34 tpd**
Annual Total:		**11,449 tpy**	**6,964 tpy**	**9560 tpy**

4.2.1 Arizona Public Service (APS) - Red Rock

The APS Red Rock electric generating station is located 70 km southwest of the Hayden smelter. The facility operates two steam turbine and two gas turbine units. The source's permit limits SO_2 emissions from combustion of fuel in the existing equipment to 15,051 tpy, however, the facility's primary fuel is low sulfur natural gas. This station was formerly a peaking plant providing increased electricity generation during periods of high demand. Commencement of full time operations began in 2000.

4.2.2 BHP Copper San Manuel Smelter

The San Manuel primary copper smelter is located approximately 46 kilometers south of the Hayden smelter and separated from the Hayden area by varied terrain that includes the San Pedro river valley and areas of mountainous ridges. When operational, the San Manuel primary copper smelter operations include a flash furnace, converters, and other auxiliary equipment for smelting and refining of copper sulfide ore. The permit limits smelter process and fugitive SO_2 emissions to 10,762 tpy. In addition, the permit limits sulfur content and usage rates for fuel used in all fuel burning equipment. The San Manuel area is also a SO_2 nonattainment area, and BHP accounts for

[19] Unless otherwise noted, all 24-hour inventories are ton per day (tpd) averages based on the number of operating hours for each respective year.

[20] BHP smelting operations have been temporarily suspended since May 1999.

[21] 24-hour inventories are averages calculated by dividing the annual facility emissions by the number of operating days for each year.

approximately 99 percent of the emissions for that area. Therefore, this smelter is documented in more detail in the ***San Manuel SO_2 State Implementation and Maintenance Plan***. ADEQ anticipates submittal of this Plan to EPA in June 2002.

4.2.3 Phelps-Dodge Miami Smelting Operations

The Miami primary copper smelter is located 46 kilometers north of the Hayden smelter and is geographically separated from the Hayden area by the 7,000 foot Pinal Mountains. The Miami facility operates an Isasmelt furnace, electric furnace, converters, and other auxiliary equipment for smelting and refining of copper sulfide ore. AAC R18-2-715 limits smelter process and fugitive SO_2 emissions to 10,368 tpy. Actual emissions, however, are less than 8,000 tpy. In addition, the permit limits sulfur content and usage rates for fuel used in all fuel burning equipment. The Miami area is also a SO_2 nonattainment area, and this smelter is documented in more detail in the ***Miami SO_2 Maintenance and State Implementation Plan***. ADEQ anticipates submittal of this Plan to EPA in June 2002.

4.3 Area and Mobile Sources

Emissions for the nonattainment area were derived from EPA NET area and mobile source inventories for Pinal and Gila Counties based on the assumption that area and mobile source emissions are proportionate to population levels. The Hayden SO_2 nonattainment area population is estimated to be three percent of the Pinal County population, and three percent of the Gila County population based on the aggregate population centers of Kearny and Dudleyville (Pinal County); and Hayden and Winkelman (Gila County). The remainder of the nonattainment area has a very low population density with low traffic levels and minimal commercial or industrial development.[22] Data shows that there are no urban areas that might be significant area or mobile sources located within the Hayden nonattainment area as illustrated in Table 4.3. Area and mobile sources combined were less than one percent of the total emissions during the attainment demonstration period.

Table 4.3 - SO_2 Emissions for the Hayden Nonattainment Area - All Sources

Source Type:[23]		**1999**	**2000**	**2001**
Area and Mobile[24]	**24 Hr.**	< 1 tpd	< 1 tpd	< 1 tpd
	Annual	50 tpy	51 tpy	51 tpy
Point	**24 Hr.**	58 tpd	47 tpd	51 tpd
	Annual	21,081 tpy	15,934 tpy	18,362 tpy
24 Hour Total:		**< 59**	**< 48**	**< 52**
Annual Total:		**21,131**	**15,985**	**18,413**

4.4 Emissions Projections

[22] See Section 1.3.2 for a more detailed description of population calculations.

[23] Area and mobile source estimates are based on EPA's AIR*Data* for Pinal and Gila Counties. Point source estimates are based on ADEQ annual emissions inventory data. See **Appendix B** for a more detailed breakdown of area vs. mobile sources.

[24] 24-hour inventories are averages based on a 365 day distribution of emissions from these sources.

Arizona does not anticipate any substantial increase in existing point source emissions between 1999 and 2015 for the nonattainment area. Should any growth occur due to construction of additional SO_2 point sources, ADEQ's permit program limits all emissions as part of the construction of new point sources or the upgrading of existing sources.

4.4.1 Point Source Projections

Projections for copper smelters are based on growth rates contained in the Western Regional Air Partnership (WRAP), *Annex to the Report of the Grand Canyon Visibility Transport Commission*, October 16, 2000. This report notes that downward pressure on copper prices resulting from the international competition has resulted in a consolidation of the copper industry in the Southwestern United States. Consequently, no expansion of the industry is expected through 2015. Emissions projection estimates for electric utilities are based on an anticipated industry growth rate of 2.6 percent per year contained in the WRAP report. These estimates are predicated, in part, on existing capacity and future demand for generation.[25]

Table 4.4 and Table 4.5 present projected emissions for point sources within the nonattainment area and within 50 km of the nonattainment boundary.[26]

Table 4.4 - SO_2 Emissions Projections for the Hayden Nonattainment Area - Point Sources							
Source Name:		**1999**	**2000**	**2001**	**2005**	**2010**	**2015**
ASARCO Hayden Smelting Operations[27]	**24 Hr.**	58 tpd	47 tpd	51 tpd	65 tpd	65 tpd	65 tpd
	Annual	21,081 tpy	15,934 tpy	18,362 tpy	23,000 tpy	23,000 tpy	23,000 tpy
24 Hour Total:		**58 tpd**	**47 tpd**	**51 tpd**	**65 tpd**	**65 tpd**	**65 tpd**
Annual Total:		**21,081 tpy**	**15,934 tpy**	**18,362 tpy**	**23,000 tpy**	**23,000 tpy**	**23,000 tpy**

25 The WRAP analysis of industry production and projections was used in the smelter and utility projections for this document. The Annex is expected to be approved by EPA at the end of 2002.

26 Unless otherwise noted, all 24-hour inventory projections are calculated based on the average number of operating hours for the period 1999 through 2001.

27 Projected 24-hour inventories are based on the average number of operating days for the period 1999 through 2001 and are assumed to represent typical operating rates for the facility.

Table 4.5 - SO_2 Projected Emissions within 50km of the Hayden Nonattainment Area - Major Point Sources							
Source Name:		**1999**	**2000**	**2001**	**2005**	**2010**	**2015**
Electric Utilities[28]	**24 Hr.**	< 1 tpd	< 2 tpd	< 6 tpd	< 7 tpd	< 8 tpd	< 9 tpd
	Annual	8 tpy	153 tpy	497 tpy	551 tpy	626 tpy	712 tpy
BHP San Manuel Smelting Operations[29,30]	**24 Hr.**	30 tpd	< 1 tpd	<1 tpd	30 tpd	30 tpd	30 tpd
	Annual	3,622 tpy	<1 tpy	<1 tpy	10,900 tpy	10,900 tpy	10,900 tpy
Phelps-Dodge Miami Smelting Operations[30]	**24 Hr.**	22 tpd	21 tpd	27 tpd	23 tpd	23 tpd	23 tpd
	Annual	7,819 tpy	6,810 tpy	9,062 tpy	8,000 tpy	8,000 tpy	8,000 tpy
24 Hour Total:		**< 53 tpd**	**< 24 tpd**	**< 34 tpd**	**< 60 tpd**	**< 61 tpd**	**< 62 tpd**
Annual Total:		**11,449 tpy**	**6,964 tpy**	**9,560 tpy**	**19,451 tpy**	**19,526 tpy**	**19,612 tpy**

4.4.2 Area, Mobile, and Total Source Projections

ADEQ projects emissions of SO_2 from area and mobile sources to grow roughly proportionately with the population of the nonattainment area. **Appendix B** describes the source category emissions projections in greater detail. Table 4.6 presents projected area and mobile, and total source emissions for the Hayden nonattainment area.[31]

Table 4.6 - SO_2 Emissions Projections for Hayden Nonattainment Area -All Sources							
Source Type:		**1999**	**2000**	**2001**	**2005**	**2010**	**2015**
Area and Mobile	**24 Hr.**	< 1 tpd	< 1 tpd	< 1 tpd	< 1 tpd	< 1 tpd	< 1 tpd
	Annual	50 tpy	51 tpy	51 tpy	53 tpy	55 tpy	57 tpy
Point	**24 Hr.**	58 tpd	47 tpd	51 tpd	65 tpd	65 tpd	65 tpd
	Annual	21,081 tpy	15,934 tpy	18,362 tpy	23,000 tpy	23,000 tpy	23,000 tpy
24 Hour Total:		**< 59 tpd**	**< 48 tpd**	**< 52 tpd**	**< 66 tpd**	**< 66 tpd**	**< 66 tpd**
Annual Total:		**21,131 tpy**	**15,985 tpy**	**18,413 tpy**	**23,053 tpy**	**23,055 tpy**	**23,057 tpy**

5.0 MODELING DEMONSTRATION

[28] Projections for electric utilities are based on the assumption of continued full time operation of the APS (Red Rock) generating station and were calculated using emissions from the most recent year of full time operations at this facility (497 tons of SO_2 emissions were recorded in 2001, the first year of full time operations).

[29] BHP smelting operations were temporarily suspended beginning May 1999. Projections for this smelter assumes resumption of operations.

[30] Projected 24-hour inventories are based on the average number of operating days for the period 1999 through 2001 and are assumed to represent typical operating rates for the facility.

[31] See **Section 1.3.2** for a more detailed analysis of population data.

Attainment is demonstrated through the clean ambient air quality record of more than seven years and use of Multi-point Rollback (MPR) modeling. The improvement in air quality is due to continuous SO_2 emissions control technologies implemented by the ASARCO Hayden smelter to comply with the SO_2 emission limits regulations adopted for Arizona smelters in September 1979. Additional air quality benefit can be attributed to the 1982 shutdown of a second Hayden smelter operated by Kennecott Corporation. This facility was purchased by ASARCO in 1986 and is only used for storage. All equipment has been scheduled for removal, and the reverberatory furnace has been demolished. A Title V permit application was not submitted to ADEQ for the Kennecott facility, and no subsequent applications for air quality permits have been received. Additionally, since this facility has been closed longer than two years, the smelter can not reopen without submitting a New Source Review (NSR) and Title V (Subpart 71) permit application.[32]

MPR, which was approved by EPA in January 1983, as a modeling technique for Arizona smelters, was selected as the most precise and reliable method for then determining contemporary and future stack SO_2 emission limits. MPR is a proportional rollback technique founded on the assumption that smelter emissions and ambient concentrations are proportional for a given set of dispersion conditions. Thus, a reduction in emissions results in a comparable reduction in ambient concentrations. Based on this assumption, the appropriate level of emission reductions to protect the NAAQS can be achieved if emissions are reduced by the ratio of the corresponding ambient concentrations to the air quality standard.

The use of MPR addresses the high variability of both smelter emissions patterns and meteorological conditions, in part, by rolling back an entire emissions curve rather than a single emissions measurement. A rollback factor is determined by fitting a concentration frequency distribution (from observed data) to an appropriate functional curve and calculating a maximum (limiting) value with an expected once per year frequency of occurrence. The rollback or reduction factor is defined as the ratio of the ambient standard to the limiting value. Rollback factors are calculated for all applicable NAAQS averaging periods. The largest calculated rollback factor is used to reduce each emission which occurred over the period of data accumulation (the emissions profile) to establish an allowable distribution of emissions rates that are protective of the NAAQS. The maximum rollback value is chosen to ensure that all primary and secondary standards are protected. In the case of the Hayden smelters, the 3-hour standard was selected as the most conservative limiting standard which is also protective of the 24-hour and annual standards.[33]

The original analysis used measured stack and calculated total SO_2 emissions over the course of a year, as well as knowledge of smelter operations, emissions variability, and meteorological conditions to construct stack emissions curves for the Hayden smelters. The curve was then "rolled-back" and the resultant distributions used directly to construct the original MPR cumulative occurrence and 3-hour average emissions limits tables for stacks. Hourly ambient SO_2 concentration data from the Montgomery Ranch monitor for the period June 1974 through December 1976, were used in the analysis.[34]

At the time of the original MPR analysis, two smelters were in operation in the Hayden area, one operated by Kennecott Corporation and one operated by ASARCO Incorporated. The combined emissions impacts from these smelters were evaluated to determine emissions limits. Among the

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32 In accordance with AAC R18-2-411.

33 A detailed discussion of Multi-point Rollback methodology is contained in *Ultimate sulfur Dioxide Emission Limits for Arizona Copper Smelters, September, 1979.*

34 The Montgomery monitor is designated as a stack impact site.

considerations in the original analysis were the segregation of the individual smelter's ambient impacts on the airshed and utilization of diffusion modeling to determine the relative contribution of stack and fugitive emissions on ambient concentrations.

5.1 Derivation of New Emissions Limits

Based on EPA's approval as a model, ADEQ utilized the MPR approach for the current attainment demonstration. The updated MPR study analyzes stack emissions and resultant ambient impacts based on current operating levels. Because the Kennecott/Hayden smelter is no longer in operation, the updated analysis is also based on the specific impact of the ASARCO smelter's emissions on the area. In addition to evaluation of stack impacts, Section 5.1.2 includes analysis of ambient impacts due to fugitive emissions. Data from July 1999, through June 2001, are used in the current demonstration and includes continuous measurement data for stack, calculated fugitive SO_2 emissions, and measured ambient concentrations. These data were used to establish new stack and fugitive emission limits in rule that will maintain emissions at a level protective of the ambient air quality standards (See **Appendix A**).

5.1.1 Stack Emissions Limits

The new SO_2 limits for stack emissions at the Hayden smelter maintain the basic MPR principles:

1. Smelter emissions and meteorological conditions are two highly variable and independent processes that together, directly influence the impact of emissions on ambient air quality;
2. Emissions limits can be set that assure a high probability of maintaining the applicable ambient air quality standards.

The new limits are in the same format as the original MPR tables. However, the derivation of the new values differs from the original in two important aspects. First, the new limits are based on current SO_2 emissions measurements. Second, it was not necessary to reduce actual emissions as the SO_2 air quality standards were met by a large margin during the two year period (July 1999 through June 2001) from which the emissions data were obtained (See **Section 3.1** and **3.2**). The following steps outline the method used in the current analysis for the new Hayden smelter stack limits:

1. Calculate a new stack emissions curve in the form of MPR based on the current 3-hour average emissions profile,
2. Calculate an average annual emissions level based on current emissions, and
3. Determine an adjustment factor for the 3-hour average and annual average emissions to establish new limits (based on ambient concentrations) to maintain future emissions at a level protective of the NAAQS.

As in the original MPR analysis, Step 3 requires segregation of the ambient effects of stack and fugitive emissions to evaluate ambient stack impacts on the airshed and to calculate an adjustment factor.

Two years of data, based on actual emissions measurements from the demonstration period (July 1999 through June 2001), were used to determine an annual average emissions value and to build an MPR 3-hour average emissions curve representative of the attainment period. Three-hour running averages for this period were ranked in descending numerical order of value. Each successive pair of ranked 3-hour values was averaged to obtain a single representative profile consisting of 8,760 hourly values for the attainment period. As with the original MPR, the highest 26 percent, or 2,240 hours, of the resulting averages was then sorted into 24 categories of cumulative frequency of occurrence values identical to the occurrence limits in the original MPR tables (0 to 2,240). The values in each emission category **(E)** were selected using the same conceptual method used in the original MPR where in each category of allowed emission occurrences **(n)**, the lowest actual emissions value in that range was used to establish the new value. For example, the **n** cumulative frequency of occurrence where **n = 7** in the MPR table based on current stack emissions corresponds to the emissions value **E** where **E = 10,368**. The measured emissions values that occur in the frequency, where **n = 7**, are **10,803, 10,396** and **10,368.** The method of selecting the cumulative occurrence and 3-hour average emission limits is outlined in **Appendix C**. The selection of the lowest measured emissions value **E** in each frequency of occurrence **n** mimics the selection of the lowest calculated values of the original MPR analysis, which were all below the emissions profile or curve.

The annual average emissions for the attainment period was determined from the calculated numerical average of the combined hourly stack emission values for the attainment period (July 1999 through June 2001). Table 5.1 contains the cumulative occurrence and emissions levels derived from attainment period data.

Table 5.1 - Hayden Smelter 3-hour MPR Stack Emissions Curve Based on Attainment Period	
Number of Cumulative Occurrences (n)	**July 1, 1999-June 30, 2001 3-hr avg Emissions lb/hr (E)**
0	13177
1	12284
2	11607
4	10867
7	10368
12	10021
20	9442
32	9085
48	8748
68	8453
94	8070
130	7713
180	7367

Table 5.1 - Hayden Smelter 3-hour MPR Stack Emissions Curve Based on Attainment Period	
Number of Cumulative Occurrences (n)	**July 1, 1999-June 30, 2001 3-hr avg Emissions lb/hr (E)**
245	7065
330	6772
435	6486
560	6215
710	5970
890	5701
1100	5457
1340	5213
1610	4984
1910	4788
2240	4576
Annual Average lb/hr	
	3680

Because the ambient air quality standards have been met in the Hayden area by a substantial margin, the next step in the analysis entailed selection of an adjustment factor to adjust the 2002 emissions curve that was calculated from actual emissions from the attainment period, to a new level that continues to maintain the NAAQS. The evaluation of an appropriate adjustment factor is based on the stack emissions impacts at the Montgomery Ranch ambient monitoring site.

The Montgomery Ranch monitor is the limiting monitor for ambient stack impacts in the Hayden area. The other area monitors are considered primarily to be fugitive impact sites. The Montgomery Ranch monitor is located in an area where fugitive or low level emissions can also contribute to measured ambient SO_2 concentrations. Stack and fugitive impacts at the Montgomery Ranch ambient SO_2 monitor are directly related to diurnal variations in atmospheric stability and dispersion patterns. Under stable atmospheric conditions, which are common during nighttime hours, fugitive emissions can influence the monitor while tall stack emissions are prevented from reaching the ground by the stable layer below.[35] Conversely during daytime hours, especially in the morning as commonly seen during inversion breakup, unstable conditions cause low level emissions (fugitives) to mix into a very diluted state, while stack emissions are more likely to affect the monitor because

[35] "Stable," as defined by the National Weather Service (http://www.phx.noaa.gov) is the condition when little or no vertical mixing occurs due to the nature of the temperature change with height. Under stable conditions, convection is inhibited, winds are generally on the light side, and pollution is easily trapped near the ground.

the unstable air brings them to lower levels.[36] As such, the 3-hour SO_2 ambient monitoring record can be separated into categories representative of the relative stack and fugitive ambient impacts.

As in the original MPR analysis, the current demonstration segregates the impacts of stack emissions from fugitive emissions based on atmospheric stability parameters. Smelter emissions data corresponding to the 50 highest 3-hour SO_2 concentrations recorded at the Montgomery Ranch ambient monitor during the attainment period were evaluated to determine the relative contribution of stack and fugitive emissions for these events and to eliminate those measurements that were predominantly the result of fugitive emissions.[37] Of the 50 highest Montgomery Ranch 3-hour sulfur dioxide concentration events, twenty events were determined primarily due to the ambient impact of stack emissions. Thirteen events were primarily due to fugitive impacts, and sixteen events were due to a combination of fugitive plus stack impacts (two of the top 50 events were overlapping, giving a total of 49 individual events). The twenty events determined to be primarily due to stack emissions were used to further analyze ambient impacts from this source. Details of the stack/fugitive segregation method are contained in Appendix C.

Because the ambient air quality standards have been met in the Hayden area, an adjustment factor was used to "roll up" the emissions curve calculated from actual emissions during the attainment period.

A design value based on the 3-hour standard was selected for determining an adjustment factor as this averaging period has been demonstrated to also be protective of the 24-hour and annual standard.[38] In accordance with EPA guidance, emission limits should be based on concentration estimates for the averaging time that results in the most stringent control requirements. When short term standards are the most restrictive for pollutants such as SO_2, the highest, second high concentration should be used as the design value.[39]

Even for the ambient events determined to be primarily due to stack emissions, a small proportion of each event can be attributable to fugitive emissions. As such, this small percentage is accounted for in the analysis. The ambient concentrations due to fugitive and stack impacts in equation 1 and 2 (FI and SI) are derived from the atmospheric stability analysis in Appendix C that was used to distinguish between emissions source impacts at the Montgomery Ranch monitoring site. Term S in equations 1 and 2 provides a more conservative regulatory concentration goal of 85 percent of the 1300 ug/m^3 3-hour standard. Consistent with EPA guidance the adjustment factor was determined from the highest second high ambient concentration attributable to stack impacts. The second highest ambient concentration due to stack emission impacts at the Montgomery Ranch monitor during the two year attainment period occurred on June 11, 2000. Based on this event, an event stack limit was calculated using the following equation:

$$\textbf{Event Stack Limit} = (A) * \frac{(S) - (FI)}{(SI)} \qquad \textbf{(1)}$$

where:

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[36] "Unstable," as defined by the National Weather Service (http://www.phx.noaa.gov) is an atmospheric state where warm air below cold air. Since warm air naturally rises above cold air, vertical movement and mixing of air layers can occur.

[37] Twenty five of the 50 highest concentrations were selected from hours during expected stable conditions and 25 during expected unstable conditions because an adequate data set is necessary to explore the variability of meteorological conditions and the stack emissions that impact high ambient concentrations.

[38] A design value is an event that was selected for evaluation.

[39] EPA guidance specifies that a violation of a short term standard occurs at a site when the standard is exceeded a second time. Therefore, it is appropriate to base emission limits to protect the standards on the highest, second-highest estimated concentration plus a background concentration which can reasonably be assumed to occur with the concentration (40 CFR Pt. 51, App W §11.2.3.1(a), (b) and (c)).

A = actual 3-hr stack emissions (lb/hr),
S = 85 percent of the 1300 ug/m^3 3-hour ambient standard or 1105 ug/m3,
FI = ambient concentration due to fugitive impact (ug/m^3), and
SI = ambient concentration due to stack impact (ug/m^3).

Or

$$\textbf{Event Stack Limit} = (8627) * \frac{(1105) - (399 - 379)}{(379)} = 24695 \text{ lb/hr} \quad (2)$$

The adjustment or roll up factor is determined by the ratio of the event stack limit to the maximum 3-hour stack emissions recorded during the two year attainment demonstration period from Table 5.1. The adjustment factor is calculated by the following equation:

$$\textbf{Adjustment Factor} = \frac{(ESL)}{(E_{max})} \quad (3)$$

Where:
ESL = Stack limit from equation 3 (lb/hr), and
E_{max} = 3-hr maximum stack emissions during two year demonstration period (lb/hr).

OR

$$\textbf{Adjustment Factor} = \frac{(24695)}{(13177)} = 1.87 \quad (4)$$

The adjustment factor from equation 4 was used to "roll-up" the 3-hour average emissions and the annual average emissions derived from attainment period data, July1, 1999, through June 30, 2001. These values become the new MPR 3-hour average and annual average limits for stack emissions as illustrated in Table 5.2. These new limits are contained in a 2002 rulemaking and will be incorporated in a future permit revision (See **Appendix A**).

Table 5.2 - Hayden Smelter MPR Stack Emissions Limits

Number of Cumulative Occurrences (n)	3-hr Average Emissions (E) (lb/hr) Based on Continuous Emissions Data From July 1, 1999, through June 30, 2001	3-hr avg Emissions Limits (E) (lb/hr), Including 1.87 Adjustment Factor
0	13177	24641
1	12284	22971
2	11607	21705

Table 5.2 - Hayden Smelter MPR Stack Emissions Limits		
Number of Cumulative Occurrences (n)	**3-hr Average Emissions (E) (lb/hr) Based on Continuous Emissions Data From July 1, 1999, through June 30, 2001**	**3-hr avg Emissions Limits (E) (lb/hr), Including 1.87 Adjustment Factor**
4	10867	20322
7	10368	19387
12	10021	18739
20	9442	17656
32	9085	16988
48	8748	16358
68	8453	15808
94	8070	15090
130	7713	14423
180	7367	13777
245	7065	13212
330	6772	12664
435	6486	12129
560	6215	11621
710	5970	11165
890	5701	10660
1100	5457	10205
1340	5213	9748
1610	4984	9319
1910	4788	8953
2240	4576	8556
Annual Average Emissions (lb/hr)		
	3680	6882

5.1.2 Fugitive Emissions Limits

Consistent with EPA guidance, assessment of fugitive emissions and determination of an adjustment factor and appropriate limits is based on the second highest ambient concentration during the attainment period attributable to fugitive impacts.[40] The second highest ambient concentration

[40] 40 CFR Part 51, Appendix W.

due to fugitive emission sources during the two year demonstration period occurred at the Globe Highway monitor on April 29, 2000.[41] Because of the proximity of this monitor to the Hayden smelter, contributions from stack sources are minimal. Based on this event, fugitive limits are calculated using the following equation:

$$\textbf{Adjustment Factor} = \frac{(S)}{(AC)} \tag{5}$$

Where:

S = 85 percent of the 1300 ug/m^3 3-hour ambient standard or 1105 ug/m3,
AC = the ambient concentration due to fugitive impacts

Or

$$\textbf{Adjustment Factor} = \frac{1105}{677} = 1.63 \tag{6}$$

The adjustment factor from equation 6 was used to adjust the annual average fugitive emissions calculated for the attainment period (Equations 7 and 8). This value becomes the new annual average limit, based on a 12 month rolling average, for fugitive emissions. This new limit is also a part of the 2002 rulemaking and will be incorporated in a future permit revision.

Annual Average Fugitive Limits = (Fugitive Emissions) * (Adjustment Factor) (7)

Where:

Fugitive Emissions = Average annual fugitive emissions during 2-year demonstration period (lb/hr).

Or

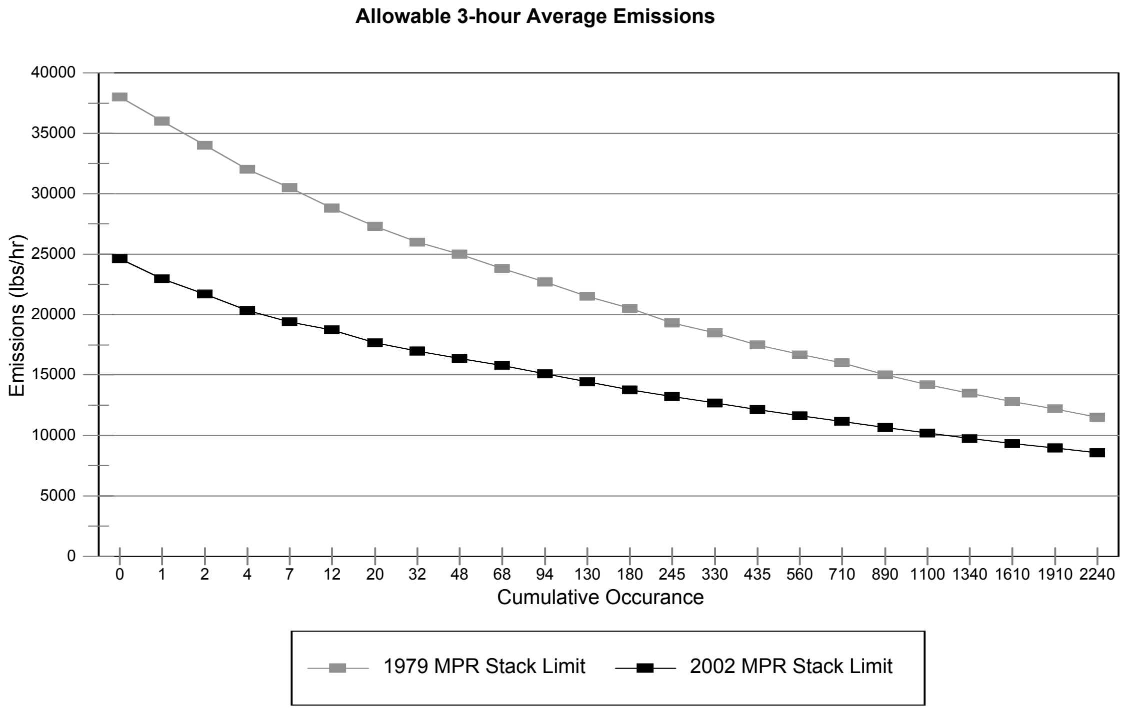
Annual Average Fugitive Limits = (181) * (1.63) = 295 lb/hr (8)

5.1.3 Total Stack and Fugitive Limits

The current analysis reduced allowable annual average stack emissions from the previous rule limit of 9,521 lb/hr to a lower level of 6,882 lb/hr. The reductions in allowable emissions from stack sources alone provide an annual reduction of 11,559 tons (approximately 28 percent for stack emissions). The corresponding reduction in allowable 3-hour average stack emissions is illustrated in Figure 5.1. In addition to the reduction in allowable stack emissions, the rule establishes a new annual average fugitive SO_2 emissions limit at 295 lbs/hr or 1,292 tpy. Annual average emissions for the combined stack and fugitive sources are limited by the rule to 7,177 pounds per hour or 31,435 tons per year.

[41] The Globe Highway monitor is a designated fugitive impact site.

Figure 5.1 - Comparison of 1979 and 2002 MPR 3-hour Average Stack Limits[42]



5.2 Smelter Configuration

Smelter configuration and in particular the location and height, of SO_2 releases was a consideration in finding the Hayden smelter in compliance with the original MPR limits and for the current demonstration of attainment of the SO_2 NAAQS. The original MPR limits for the Hayden smelter were based on 1976 records of SO_2 emissions and ambient concentrations. The smelter achieved compliance with MPR emission limits in 1987 and remains in compliance to date. Although the smelter underwent major modifications and emission reductions over the years, the location and heights of SO_2 releases have changed only slightly. Basically, emissions can be grouped into two categories based on the height of release. Low level emissions at heights generally less than 200 feet include fugitive emissions. High level emissions are predominantly from the 1000 foot main stack. **Table 5.1** shows the release heights for 1976 compared to the most recent years of operation 1999 through 2001. In addition, distances of the individual emission points to the facility property boundary have changed little since 1976.

Thus the ambient SO_2 network established in the 1970's and refined in the 1980's, including extensive sampling and testing for fugitive SO_2 impact sites, occurred at a time with quite consistent release heights. This consistency of SO_2 release locations continued through the 1990's thereby providing assurance that the ambient SO_2 monitoring network continues to represent the maximum impact of SO_2 emissions from the Hayden smelter.

[42] Limits contained in AAC R18-2-715(F).

Table 5.3 - Hayden Smelter Configuration 1976 to Present				
Emissions Source	**1976 Height (ft)**	**Present Height (ft)**	**1976 Process Emission Source**	**Present Process Emission Source**
High Level				
Main Stack (core)	1000	1000	Acid Plant	Acid Plant
Main Stack (annulus)	991.5	991.5	Captured dryer, furnace, and converter fugitive emissions	Captured dryer, furnace and converter fugitive emissions
Low Level				
Fugitives	130	130	Direct converter, furnace, and anode furnace fugitive gases	Converter, furnace, and anode furnace gases not captured by primary or secondary hood system

5.2.1 Good Engineering Practice Stack Height

The Good Engineering Practice (GEP) Stack Height Limitation codified at AAC R18-2-332 ensures that emissions from a stack do not result in excessive concentrations of any air pollutant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, nearby structures, or nearby terrain obstacles.

The Hayden smelter's 1000 ft stack for the #2 acid plant and a 991.5 ft annular stack for the furnace and converter fugitive emissions was built in 1974. Assessment of GEP stack height at ASARCO's Hayden smelter was conducted jointly by North American Weather Consultants (NAWC) and Colorado State University (CSU). The modeling and analysis demonstrated that the 305 meter (1000 ft) ASARCO stack meets GEP stack height requirements and concluded that emissions from the stack do not result in excessive concentrations of any air pollutant. EPA approved Arizona's SIP determination of GEP stack height on January 14, 1983 (48 FR 1717).

6.0 CONTROL MEASURES

Because the ASARCO smelter is responsible for the majority of SO_2 emissions in the Hayden area, the following attainment demonstration control measures relate specifically to ASARCO smelting operations. Applicable controls for other point sources in the Hayden nonattainment area are discussed in Chapter 4.0.

6.1 Background [43]

Smelting operations began at Hayden in 1912. The original facility employed twelve multiple-hearth roasters and two reverberatory furnaces to process copper sulfide ore. Today the Hayden primary copper smelter utilizes an oxygen flash smelting process as well as converters and anode furnaces to produce anode copper . An oxygen plant produces oxygen for the furnace and a sulfuric acid plant recovers the sulfur dioxide produced during smelting. A water treatment plant recovers process water from both the acid plant and flash furnace gas cleaning systems for reuse. The facility has a processing capacity of more than 720,000 tons of copper concentrate per year and meets all federal and state emissions regulations.

Concentrate Receiving and Sampling:

The processing of copper sulphide ore begins at the mine sites where, to facilitate transportation to smelters, concentration of the ore is accomplished via crushing, grinding, and a flotation process to separate copper mineral from ore. Concentrates, containing approximately equal parts of copper, iron, and sulfur, are received at the Hayden smelter by truck and rail where they are sampled to determine moisture content and analyzed for determination of metal content. The concentrates are then sent to the Unloading Department for further processing.

Concentrate Feed and Preparation:

The Hayden smelter Unloading Department prepares feed for the flash furnace. The feed consists of concentrate, flux, and recycled by-products from the smelting process. Flux and by-products are blended with the concentrate to build a homogenous "mix." A sample of the mix is analyzed for input in a computer simulation to determine smelter performance during smelting of the feed. Corrections to the mix are made as needed to ensure proper metallurgical processing performance of the smelter.

Flash Furnace:

At the Flash Furnace Department wet feed, consisting of pre-blended concentrates, flux, and by-products, is screened and sized in preparation for drying. The feed is dried in one of two fluid bed dryer circuits and is reclaimed in one of the two baghouses. Dried feed is introduced into the INCO design flash furnace with 95 percent pure oxygen at one of four burners and are rapidly oxidized in the oxygen rich atmosphere. Dust laden hot gas from the flash furnace, containing approximately 75 percent SO_2, is drawn through the furnace uptake into the gas handling system. The off gas is ducted

[43] Calculations used in this section were based on the following:

a. US EPA, AP-42, Compilation of Air Pollution Emission Factors, Fifth Edition, August 31, 1998.
b. ASARCO Smelter Federal Operating Permit Application, submitted November 1, 1994.
c. ASARCO Smelter 1998 Emissions Inventory Survey.

to a saturation tower where large particulates are captured and the gas is cooled. From the saturation tower, the gas is ducted to a Venturi scrubber for further dust removal, through a cooling condenser to remove water vapor, and finally through the furnace fan to the acid plant scrubber for treatment in the acid plant. All dust slurry from the saturation tower runs down one of two 12" launders to a clarifier. The clarifier overflow is re-circulated through the saturation tower while the underflow is stripped of SO_2 and sent for processing in the water treatment plant. The remaining products of flash smelting are matte and slag.

Molten material produced in the flash process separates into two layers in the furnace, the top layer being iron rich slag and the lower layer being heavier, copper laden matte. Molten copper matte is tapped through covered launders for transfer to the converters. Slag is skimmed off the top of the bath and analyzed for copper content for future recovery. The slag temperature is also taken to assist in optimum furnace operation.

Converters:

The converter department consists of five Pierce-Smith type converters. Molten matte, containing approximately 58 percent copper, is transferred to the converters from the flash furnace for further oxidation of sulfur and slagging of iron and other metals until the copper reaches a purity of about 99 percent. Blister copper is produced in the converters by injecting air into the liquid matte for further oxidation and removal of sulfur from the copper. Silica is also added in the converting process to separate iron from the copper. The silica combines with iron in the matte to generate slag. The slag is skimmed off leaving nearly pure copper ready for transfer to the anode department.

Each converter is equipped with primary and secondary hooding systems. The primary hooding system captures the strong SO_2 gas for dust removal prior to treatment at the acid plant. The secondary hooding captures any fugitive gases that escape the primary hood or are emitted when skimming and charging. Gases that are collected by the secondary hooding report to a baghouse for dust removal and exhaust to the atmosphere via the 1000-foot stack.

Anodes:

The anode department consists of two anode furnaces and a spare furnace used when one of the two is out of service. Each furnace holds about 300 tons of copper from the converters. Once an anode furnace is filled, air is blown through the tuyeres to oxidize the copper. The remaining impurities are trapped in this oxide slag along with copper oxide. The oxide slag is skimmed off and the anode furnace is "poled" by bubbling methane (natural gas) through the copper. The poling stage removes excess oxygen left from the oxidizing stage. It produces anode copper, which is more than 99 percent pure, for casting into anodes. Anode copper is cast on two wheels, each with 16 anode molds. One overhead crane removes the anodes from the anode wheels and places them in banding racks or rack rail cars for transport to an off-site electrolytic refinery.

Acid Plant:

Exit gas from each converter is ducted to cyclones that remove heavy particulate from the gas streams. There are three cyclones for each converter (total of fifteen). Dust collected in the cyclones is conveyed via screw conveyors to a dust bin for pick-up by front end loader and recycle to the bedding system as smelter feed. Converter gases enter the cyclones at 800 deg F and four percent SO_2.

The gases then report to the spray chambers for further cooling with water sprays. The flow is split equally between two identical chambers and is at about 400 deg F exiting the spray chambers. All the gas then reports to the Cottrell sections that act as settling chambers. Any dust captured is collected by screw conveyors and sent to the pug mill so airborne particulate is minimized. The next step is the three induced draft (I.D.) fans that pull gases from the converters and send them to the scrubber system. These fans are each powered by a 500 H.P. constant speed electric motor. Outlet dampers provide draft for the converters by matching a set point on the Cottrell inlet header.

Converter gas finally enters the scrubbing system where it mixes with furnace gas in the 50 percent scrubber. This is a brick lined vessel with co-current sprays fed from a slurry type pump. The gas stream (converters and furnace) splits when it leaves the unit with half going to two (north and south) secondary scrubbers. These units are similar to the 50 percent scrubber except smaller. The gas stream then enters the gas cooling towers. Gas flows upwards through polypropylene packing against the liquor flow from sprays at the top of the tower. The dew point of the gas stream is lowered which forces water to drop out. This further scrubs the gas and minimizes the water being carried to the contact section of the plant. The liquor is pumped from the bottom of the towers through several plate and frame heat exchangers and back to the top of the towers. The water to cool the liquor is provided by a Marley cooling tower. The gas leaving the gas cooling towers is normally between 85 and 95 deg F. The gas is dust free but totally humidified. Mist precipitators are next which use electrostatic fields to remove contained water droplets. Process gas then reports through a fiberglass duct to the inlet of the drying tower. Treatment of the gas in the contact section consists of several steps listed as follows:

a. Drying of the sulfur dioxide (SO_2) gas from the gas purification system.
b. Conversion of sulfur dioxide gas to sulfur trioxide gas.
c. Absorption of the sulfur trioxide (SO_3) gas in sulfuric acid.

Detailed process flow diagrams are included in this submittal in Appendix C.

Prior to 1971, all smelting operations process gasses were emitted into the atmosphere after particulate removal by electrostatic precipitators. The installation of an acid plant in late 1971 added SO_2 control for primary converter gas. From sulfur balance data the average emissions were reported to be more than 100,000 tpy. A series of improvements in 1983 included replacement of twelve multiple-hearth roasters and two reverberatory furnaces with an INCO Flash smelting furnace. During the flash furnace conversion, ASARCO also installed a 650 ton per day oxygen plant to enrich the smelting process gases and replaced the existing contact acid plant with a new double-contact acid plant with a production capacity of 2,820 tons of sulfuric acid per day for treatment of all flash furnace and converter primary process gases. Reduction of SO_2 emissions for this project was estimated at 63,584 tpy.

The double-absorption sulfuric acid plant is the predominant control device for primary process SO_2 emissions produced by the flash furnace and converters. The flash furnace provides a steady gas feed to the acid plant, enabling optimal plant performance. The acid plant provides control of process gas SO_2 at or below the outlet SO_2 concentration limit of 0.065 percent by volume set forth in the federal New Source Performance Standard 40 CFR 60, Part P. The SO_2 control performance for the ASARCO acid plant is an outlet emission concentration of 0.015 percent by volume. The acid plant input of SO_2 gas is 80,000 ppm with an output of 150 ppm, resulting in a 99.81 percent recovery rate.

The annual average process capacity for the acid plant is 666,044 tons of acid per year. The average annual process rate for the smelter is estimated at 88 tons per hour (tph) of new sulfide concentrates. Recent process rates (1999 through 2001) have generally been within 80 percent of capacity. The production throughput of this facility, however, is dependent upon the operational capacity of the sulfuric acid plant to treat SO_2 emissions from the flash furnace and the five converters. At the present time, the acid plant has the capacity of processing the emissions from the flash furnace in combination with two out of five converters. An increase in furnace or converter facilities would require a corresponding increase in acid plant capacity.

The flash furnace, oxygen plant, acid plant, and other improvements made during the transition from the roasters and reverberatory furnaces to the flash furnace, subsequently reduced the SO_2 emissions rate by forty percent. This improvement is demonstrated in Figure 6.1, which illustrates the pre-control and post-control SO_2 emission levels.

In 1998, ASARCO modified the smelter's existing gas handling system and installed an $18.4 million dollar wet gas handling system. Existing equipment including a settling chamber, quench tower, and electrostatic precipitators were replaced with a saturation tower, Venturi scrubber, cooling condenser and ancillary equipment. This modification allowed flash furnace off gas to be treated at temperatures less than 200° F compared to the previous system's 600° F. As a result, the flash furnace off gas volume was lowered and consequently the grade of SO_2. This enabled the acid plant to provide more ventilation to the converters and reduce the SO_2 in the secondary hooding gases along with any fugitive emissions escaping the secondary hoods.

The average rate of SO_2 in the secondary hood gases was approximately 6,000 lb/hr in the period 1994 through 1997. This average has been reduced to approximately 3,000 lbs/hr since implementation of the flash furnace scrubber system, and is the largest component of the reduction in annual SO_2 emissions. The improved ventilation to the converters provided by the 1998 scrubber installation has decreased stack emissions and the associated fugitive emissions due to escape from the converter secondary hood system. The secondary hooding system is operated at the same nominal 250,000 scfm flow as prior to the modification, however, the SO_2 concentration in the secondary hooding gases has been reduced by half. A computerized process control system sets the system dampers at their maximum effectiveness based on the converter cycle. This system is designed to effectively capture fugitive emissions from the primary ventilation system and vent the gases to the stack.

Consequently, emissions that escape the secondary hoods, primarily under roll in and roll out conditions, contain 50 percent less SO_2 compared to pre-scrubber operation, resulting in a significant reduction in fugitive SO_2 emissions. This improvement is demonstrated in Figure 6.2, which illustrates recent the pre-control and post-control SO_2 emission levels. The improvement is also reflected by the reduction in peak 3-hour ambient SO_2 concentrations (See Chapter 3).

Additional equipment improvements have been made to improve the collection and control of fugitive SO_2 emissions. As previously noted, sources of secondary process emissions are hooded to minimize release of fugitive emissions directly to the atmosphere. The captured gases are treated with lime injected into the flue system and then directed to baghouses prior to exhausting to the atmosphere. In 1996 ASARCO installed a $4.2 million dollar secondary hood baghouse. The new equipment improved the control of fugitive emissions and reduced opacity. To further reduce fugitive SO_2 emissions, ASARCO repaired converter flues, replaced primary converter hoods and jackets, rebuilt all units in the Cottrell electrostatic precipitator, installed concrete sumps and improved sprays in the gas spray chamber of the acid plant in 1991 at a cost of $915,000.00. In 1999, newly designed primary hood doors were installed on two converters. The new design, incorporating a flexible seal, improved the seal between the door and the primary hood and increased the capture efficiency of the primary hood to minimize escape of emissions to the secondary hood system. Additional doors were installed on the remaining three converters in 2000. After the change, a decrease in future sulfur oxides emissions is estimated at 827.6 tpy, which is approximately a five percent reduction in the total

smelter emissions. These changes meet or exceed RACT requirements.
The emissions control improvements implemented at the ASARCO smelter are summarized in Table 6.1 below.

Table 6.1 - Implementation of SO_2 Process and Control Technology at the Hayden Smelter	
Year	**Equipment**
1971	Installation of N0. 1 Acid Plant.
1972	Acid Plant Mist Precipitator Modification. Installation of Reverberatory Vent Fans to improve ventilation.
1973	Installation of Acid Coolers (Crane) for improved acid plant performance and Matte Fume Vent to improve the capture of fugitive emissions.
1974	Installation of Converter Spray Chamber for particulate removal and Plate Heat Exchanger.
1975	Matte Fume Enclosing to improve the capture of fugitive emissions.
1976	Installation of Separator - Demister to improve acid plant performance.
1978	Installation of Flue Gas Sampling Station.
1980	Installation of secondary hooding on the converters to minimize release of fugitive emissions directly to atmosphere.
1983	Replacement of multiple-hearth roasters and reverberatory furnaces with an Inco flash smelting furnace and gas handling equipment including slag skimming hoods, matte tapping hoods, and slag return hoods at the flash furnace for improved sulfur recovery. Installation of gas cleaning mist precipitators.
1983/ 1984	Installation of Monsanto acid plant No. 2 for treatment of all primary process gases.
1988	Installation of acid plant APV Heat Exchanger to improve gas cleaning performance.
1989	Electric slag cleaning vessel with an SO_2 control device; a caustic scrubber that controls a portion of the overall SO_2.
1991	Shutdown of acid plant No.1. Repair of a gas-to-gas heat exchanger leak at the acid plant. Repaired converter flues; replaced primary converter hoods and jackets; rebuilt all units in the Cottrell electrostatic precipitator; installed concrete sumps and improved sprays in the gas spray chamber of the acid plant to reduce fugitive SO_2 emissions.
1993	Upgrade of acid plant mist precipitator and acid plant intermediate fan.
1993	Modification of flash furnace uptake and replacement of cooling fins on the settling chamber to prevent the generation of fugitive emissions caused by inadequate cooling.
1995	Replacement of acid plant heat exchanger and retube of cold heat exchanger.

Table 6.1 - Implementation of SO_2 Process and Control Technology at the Hayden Smelter	
1997	Retube of Tail Gas Reheater Heat Exchanger.
1998	Installation of wet gas handling system for improved treatment of furnace emissions. Installation of new Hot IP Heat Exchanger; Cold IP Heat Exchanger; SX Distribution in IP Absorbing Tower; Foxboro IA distributive process control system.
1999/ 2000	Redesign of converter primary hood doors. The gaps in the primary hoods at the converter mouths were redesigned and a flexible seal installed to minimize the escape of fugitive emissions to the secondary hooding system.
2000	CEM Upgrade (Stack Monitors)

Figure 6.1 - Asarco Smelter SO_2 Emissions and Percent Control

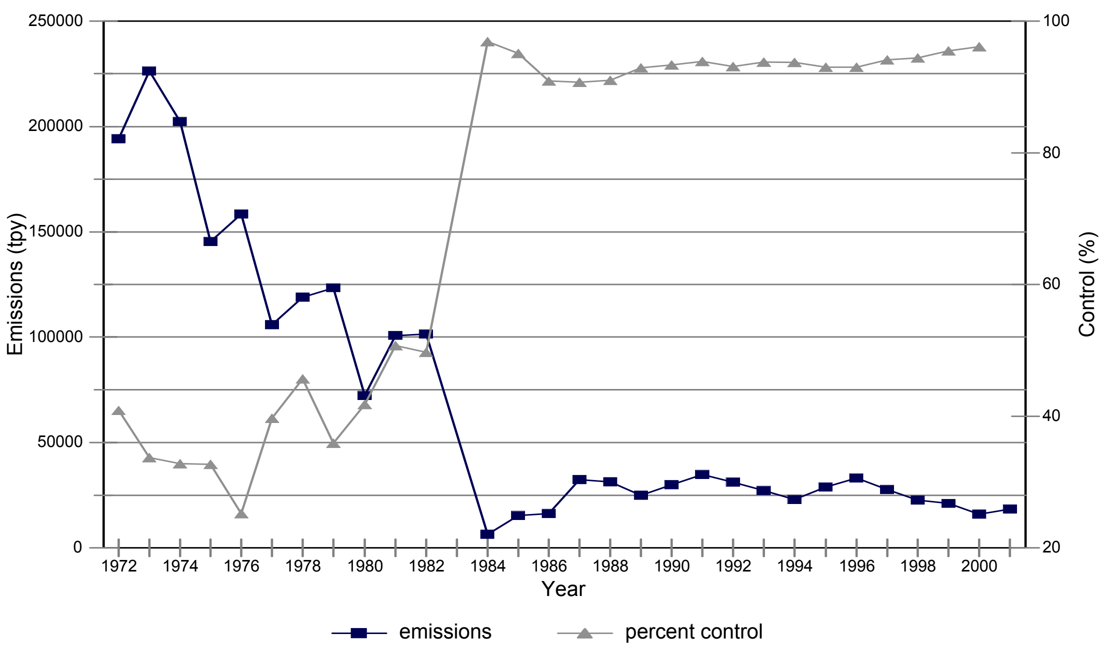
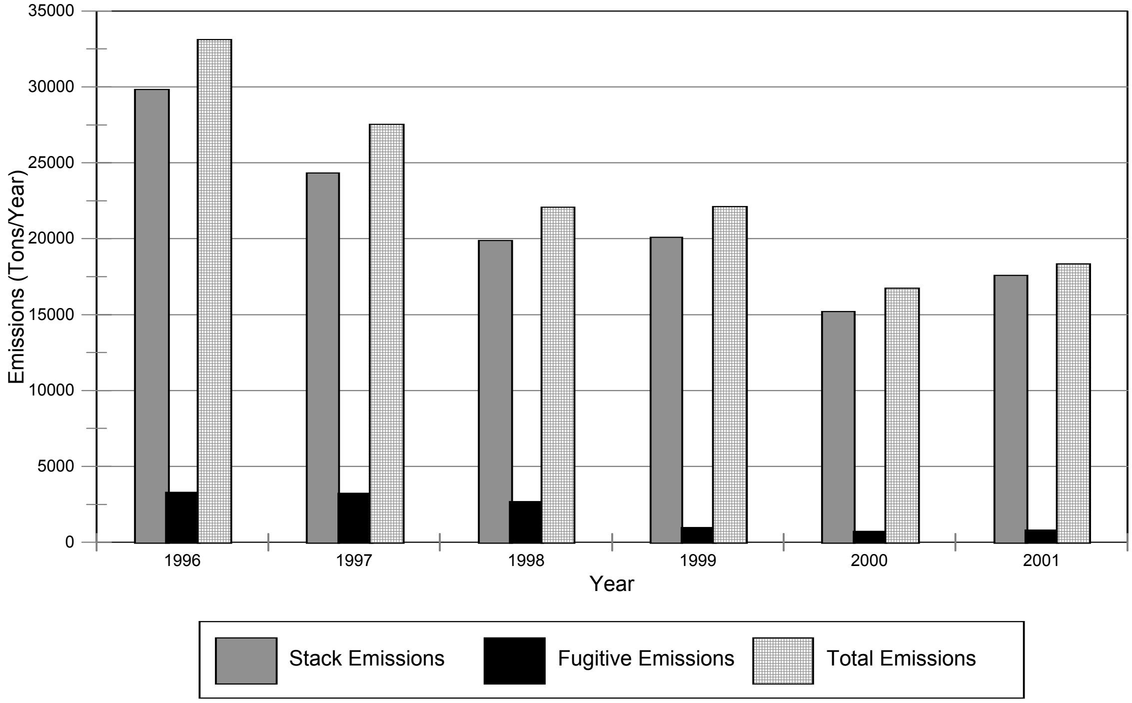


Figure 6.2 - Asarco Smelter SO_2 Emissions



6.2 Emissions Limitations for ASARCO Hayden Smelter

<u>6.2.1 AAC Rule R18-2-715(F), R18-2-715(G) and R18-2-715.01 - Standards of Performance for Existing Primary Copper Smelters: Site specific requirements; Compliance and Monitoring</u>

Measure Description:

In 1979, ADEQ promulgated site specific emissions limits at Arizona Code of Rules and Regulations R9-3-515, currently codified at AAC R18-2-715 (See **Appendix A**). The rule required all existing primary copper smelters to implement control technology sufficient to comply with the 1979 MPR stack limits as well as any fugitive emissions control technology necessary to assure attainment and maintenance of the NAAQS. The following emissions limits were specified for the ASARCO copper smelter at Hayden:

1. Annual average stack emissions, as calculated pursuant to AAC R18-2-715.01(C) through (J) shall not exceed 9,521 lbs/hr. The number of three-hour emissions, as calculated pursuant to AAC R18-2-715.01(C) through (J) shall not exceed the limits as listed in AAC R18-2-715(F).

ADEQ's 2002 rule revision incorporated the following voluntary stack limits and added fugitive limits for the ASARCO smelter (See **Appendix A** for rule revision):

1. Annual average stack emissions, as calculated pursuant to AAC R18-2-715.01(C), shall not exceed 6,882 lbs/hr. The number of three-hour emissions, as calculated pursuant to AAC R18-2-715.01(C), shall not exceed the revised limits listed in AAC R18-2-715(F).
2. Annual average fugitive emissions, as calculated under AAC R18-2-715.01(T), shall not exceed 295 lbs/hr.

Estimated SO_2 Emission Reduction:

Emissions were reduced 63,584 tpy following compliance with the 1979 rule (due to installation of flash furnace). Subsequent implementation of additional emissions collection and control measures enabled the 2002 revision that provides a further reduction in allowable emissions of 11,559 tpy for stack sources.

Responsible Agency and Authority for Implementation:

ADEQ is the responsible agency with authority designated by ARS §49-104(A)(11) and ARS §49-422.

Implementation Schedule:

The 1979 rule provided a compliance date of January 14, 1986, unless otherwise provided in a consent decree or a delayed compliance order. The compliance date for the 2002 rule revision is the effective date of the rule.

Level of Personnel and Funding Allocated for Implementation:

No additional personnel are required; implementation funding for ADEQ personnel is underwritten through emission and inspection fees. The approximate cost to the smelter is $123,000 per annum for operation and maintenance of the ambient air analyzers. Expenditures for emissions collection and control improvements at the smelter are noted below.

Enforcement Program:

ADEQ is responsible for tracking the progress made through the implementation of this measure and for enforcing all applicable regulations through the schedule of inspections and the development of compliance and enforcement actions. (See **Section 7.3** for a description of inspection and compliance and enforcement procedures.)

Measure Monitoring Program:

ASARCO submitted a proposed compliance schedule in 1982, for achievement of the 1979 MPR stack emission limits as expeditiously as practicable. The smelter subsequently submitted a permit application in 1983 (permit #0308-85) for installation of $123 million worth of emissions collection and control improvements. All on-site construction and installation of emission control equipment and process modification was completed by 1984, meeting the compliance date of January 14, 1986. The collection and control technology implemented by ASARCO including installation of the wet gas handling system in 1998 has allowed the facility to reduce emissions sufficient to demonstrate attainment and to accept additional emissions reductions in 2002 (See **Section 6.2** for a description of the implemented equipment).

For purposes of determining compliance with the emissions limits as codified in 1979, ASARCO was required to install, calibrate, maintain, and operate a measurement system for continuously monitoring SO_2 concentrations and stack gas volumetric flow rates in each stack that could emit five percent or more of the allowable annual average SO_2 emissions from the smelter. Demonstrations of stack gas volumetric flow rate and SO_2 concentration measurement systems required by subsections AAC R18-2-715.01 (K)(5)(a) and (b) were initiated in 1983. The location of all stack sampling points were approved by ADEQ prior to installation and operation of the continuous emission monitoring systems (CEMS). In response to a Consent Decree (CIV 81-110 GLO ACM, dated June 22, 1981), ASARCO installed and operated a continuous emissions monitoring system. ASARCO operates CEMS at the outlets of number 2 acid plant, the furnace vent gas flue, and the converter secondary hood flue. In addition to primary process gas, captured fugitive emissions including those captured by the secondary hooding system are continuously monitored for SO_2 concentrations and stack gas volumetric flow rates, and are included when determining compliance with the cumulative occurrence and emissions limits contained in R18-2-715(F)(1). Monitoring and emissions data submitted by ASARCO indicated that the smelter was in compliance with the 1979 emission limits by 1984.

Provisions for minimum performance and operating specifications for CEMS at this facility are contained in AAC R18-2-715.01(K)(5). Additional requirements for emission monitoring of the sulfuric acid plant are contained in AAC R18-2-313, Existing Source Emissions Monitoring. The ASARCO smelter stack and fugitive continuous emissions monitoring system is subject to the manufacturer's recommended zero adjustment and calibration procedures at least once per 24-hour operating period and meets all applicable performance specification and quality assurance procedures contained in 40 CFR 60, Appendix B and F. Daily calibration and quarterly audits conducted by ASARCO are reported to ADEQ. To ensure continued compliance, ASARCO maintains on hand and has ready for immediate installation sufficient spare parts or duplicate systems for the continuous monitoring equipment to allow for the replacement within six hours of any monitoring equipment part which fails or malfunctions during operation.

As required by AAC R18-2-715.01 (L), ASARCO measures at least 95 percent of the hours during which emissions occurred in any month and has not failed to measure any twelve consecutive hours of emissions. ASARCO maintains records of all average hourly emissions measurements for at least five years following the date of measurement as required by 40 CFR 60 Subpart P - Standards of Performance for Primary Copper Smelters. All of the following measurement results are expressed as pounds per hour of SO_2, summarized monthly, and submitted to ADEQ within 20 days after the end of each month:

1. The annual average of the month;
2. The total number of hourly periods during the month in which measurements are not taken and the reason for loss of measurement for each period;
3. The number of three-hour emissions averages which exceeded each of the applicable emissions levels listed in AAC R18-2-715(F) (and AAC R18-2-715(G)) subsequent to the 2002 revision) for the compliance periods ending on each day of the month being reported;
4. The date on which a cumulative occurrence limit listed in R18-715(F) (and R18-2-715(G) subsequent to the 2002 revision) was exceeded if such exceedance occurred during the month being reported.

These submitted reports have shown continued compliance with all applicable regulations and averaging standards. ADEQ has not issued any notices of compliance actions for a monitoring violation to this facility.

As a means of determining total overall emissions, ASARCO performs a monthly material balance for sulfur and includes the results in the monthly compliance reports to ADEQ. Based on these reports, the smelter documents a sulfur recovery rate over 95 percent.

In addition to monthly compliance reports, ADEQ also receives from ASARCO quarterly audit, upset, and excess emissions reports, as well as annual emissions inventory reports based in part on the SO_2 CEMS data.

The rule also specifies requirements regarding bypass operations. At each point in the smelter facility where a means exists to bypass the sulfur removal equipment, the bypass is instrumented to detect and record all periods that the bypass is in operation. The facility's emergency ventilation damper has been used during periods when the plant is shut down for repairs or in emergencies. All production activities at the smelter cease during use of the emergency ventilation damper. ASARCO reports the required information to ADEQ, not later than the 15th day of each month, and includes an explanation for the necessity of the use of the emergency damper.

6.2.2 AAC Rule R18-2-715.02 Standards of Performance for Existing Primary Copper Smelters; Fugitive Emissions

Measure Description:

This measure provides for an evaluation of the ambient impact of fugitive emissions from the Hayden smelter. The regulation requires a measurement or accurate estimate of fugitive SO_2 emissions to determine whether these emissions have the potential to contribute to violations of the ambient SO_2 standards in the vicinity of the smelter. The rule also requires the adoption of rules specifying emission limits or other appropriate measures necessary to maintain the standards.

Estimated SO_2 Emission Reduction:

A reduction of 828 tpy is estimated due to implementation of fugitive emissions collection and control measures.

Responsible Agency and Authority for Implementation:

ADEQ is the responsible agency with authority designated by ARS §49-104(A)(11) and ARS §49-422.

Implementation Schedule:

The rule provides a compliance date of January 14, 1986.

Level of Personnel and Funding Allocated for Implementation:

No additional personnel is required; implementation funding for the fugitive emission evaluation study was provided by ASARCO. The approximate cost of the SO_2 fugitive emission evaluation study was one million dollars.

Enforcement Program:

ADEQ is responsible for tracking the progress made through the implementation of this measure and for enforcing this measure through the schedule of inspections and the development of compliance and enforcement actions (See **Section 7.3** for a description of inspection and compliance enforcement procedures).

Measure Monitoring Program:

Fugitive SO_2 emissions at the ASARCO smelter are primarily generated from the flash furnace, converter, and anode process areas. Emissions escape the ventilation systems and exit the buildings through roof vents. These structures mounted on the roofs of the building provide an escape route for uncaptured emissions. A portion of the SO_2 emissions may escape through other exit points, such as open walls and doors in the building. These alternate exit points were identified by ASARCO through flow visualization tests and survey sampling. The following study and other data gathered demonstrated that the majority of the SO_2 fugitive emissions escape from the furnace and the converter processes and identify the converter area as the primary source of uncaptured emissions at the smelter.

On April 11, 1996, ASARCO submitted to the Arizona Department of Environmental Quality a fugitive SO_2 emissions description, evaluation, and ambient impact study, to fulfill the outstanding SIP commitments for analysis of fugitive emissions. The study was conducted from September 6, 1994, through March 22, 1995, and utilized meteorological data collected to characterize fugitive SO_2 emission dispersion conditions and measured emissions to evaluate the impact of fugitive emissions in the Hayden area. The study concluded that fugitive SO_2 emissions from the converter and furnace buildings represent nearly 99 percent of the fugitive SO_2 emissions from the smelter and identified converter operations as the major source of fugitive emissions. The furnace building emitted 288 lbs/hr or thirty-five percent and the converter building emitted 525 lbs/hr or 64 percent. The studies concluded that fugitive emissions will neither cause nor significantly contribute to a violation of the NAAQS. Summaries of the fugitive emissions studies are contained in Appendix C.

Measures to improve collection and control of fugitive emissions together with control of primary process gasses have reduced total emissions to a level protective of the NAAQS in the Hayden area (See **Section 6.2** for a description of implemented equipment). Captured fugitive emissions currently comprise more than 85 percent of total facility emissions and are included when determining compliance with the stack limits described in Section **6.3.1**.

6.2.3 ASARCO Permit Conditions

Reasonably Available Control Technology (RACT) for sources located in SO_2 nonattainment areas is defined as "that control technology necessary to achieve the NAAQS and is determined by the technological and economic feasibility of the control."[44] Submittal of biennial compliance certifications under AAC R18-2-309(2)(a) are required to demonstrate the compliance status of the source with all applicable permit conditions. Controls implemented by ASARCO to reduce smelter emissions and comply with emissions limit regulations are included in the following permits outlined in Table 6.2, found on the following page. All listed controls have been captured in the facility's Title V permit. Additionally, ASARCO submitted a standard Title V permit application form to ADEQ on November 2, 1994. The application for the ASARCO smelter including the Inco oxygen flash furnace, Pierce-Smith converters, anode furnaces, concentrate dryers, double absorption acid plants, oxygen plant, gas cleaning plant including electrostatic precipitators, filter plant, revert crushing plant and associated equipment has been processed and the final permit was issued on October 9, 2001.

Table 6.2 - Permit Conditions		
Date	**Permit #**	**Controls**
September 10, 1984	0308-85	Retrofit to install Inco Flash Furnace, oxygen plant, and double contact acid plant to treat process gases.
April 4, 1989	1215	Installation of electric slag cleaning vessel.
October 9, 2001	1000042	Requires maintenance and operation of all collection, process, and control equipment in a manner consistent with good air pollution control practice. Continued operation of CEMS is required to monitor and record SO_2 discharge emissions rates from the smelting facility. Continued operation, maintenance, and calibration of all current ASARCO ambient SO_2 monitors are also required.

7.0 MAINTENANCE PLAN

Section 107 (d) (3) of the amended CAA requires that nonattainment areas must have a fully-approved maintenance plan meeting the requirements of Section 175 (A) before they can be

[44] US EPA Office of Air and Radiation, Office of Air Quality Planning and Standards, "SO_2 Guideline Document," February 1994.

redesignated to attainment. Section 175 (A) requires submittal of a SIP revision that provides for the maintenance of the NAAQS for at least 10 years after the redesignation to attainment. The required components of the maintenance plan include:

1. A demonstration that future emissions of SO_2 will not cause a violation of the SO_2 NAAQS,
2. A commitment to continue to operate an appropriate air quality monitoring network to verify the attainment status of the area,
3. Assurance that the state has the legal authority necessary to implement and enforce all necessary measures used to attain and maintain the NAAQS,
4. An indication of how the state will track the progress of the maintenance plan, and
5. A contingency plan that contains measures to promptly correct any violation of the NAAQS that occurs after redesignation.

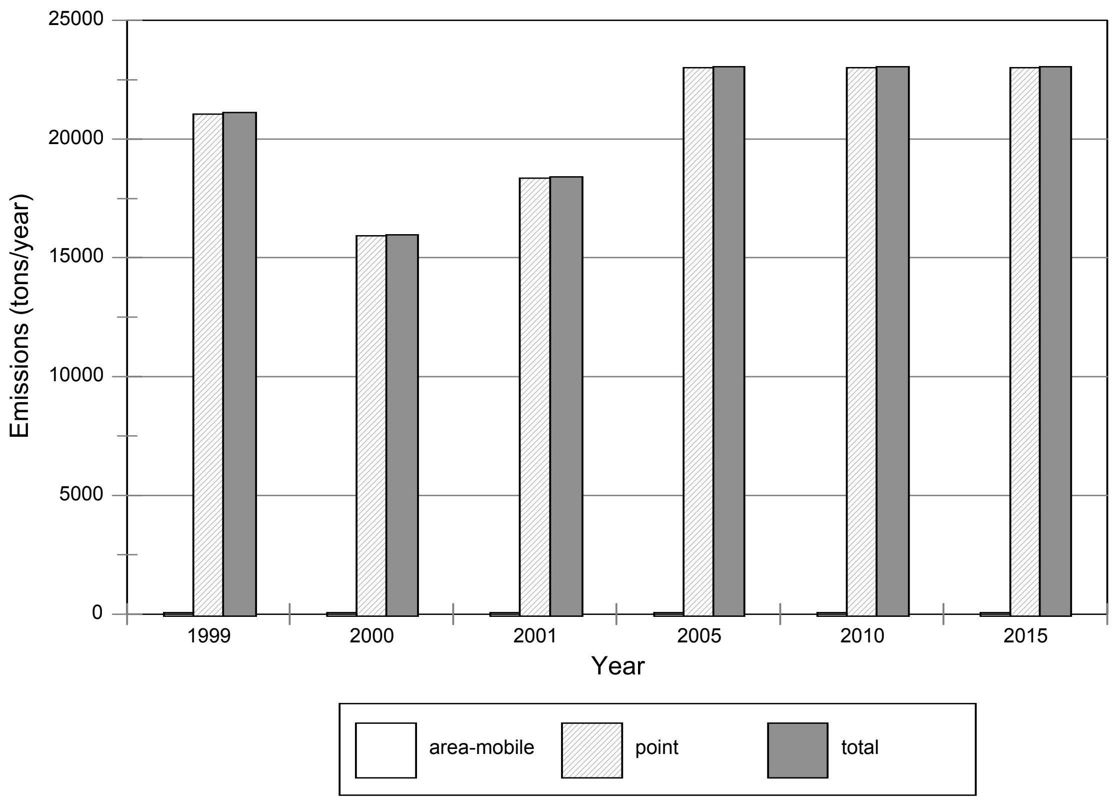
This submittal demonstrates that all of the above required elements have been met. ADEQ also commits to a SIP revision subsequent to this submittal providing for maintenance of the NAAQS for an additional ten years. This subsequent revision is due eight years into the first ten year maintenance period.

7.1 Maintenance Demonstration

Copper smelting operations at the ASARCO facility are the single greatest source of SO_2 emissions in the Hayden nonattainment area comprising more than 99 percent of total emissions in the area. The conservative emissions limits that have been established for the smelter are based on actual emissions for July 1999 through June 2001 of smelter operations showing attainment of the SO_2 NAAQS (See **Chapter 4**). Once the area is redesignated, any new sources or modifications to existing point sources of SO_2 are subject to the new source permitting procedures contained in AAC Title 18, Chapter 2, Article 4, specifically, ADEQ's Prevention of Significant Deterioration (PSD) Permitting Program contained in AAC R18-2-406. The regulations were established to preserve the air quality in areas where ambient concentrations are below the NAAQS and require stationary sources to undergo preconstruction review, utilizing BACT, before the facility is constructed, modified, or reconstructed.

Projections of 2000 base year attainment inventories for the ASARCO smelter and all other point sources in the nonattainment area are included in Table 4.3 of this submittal. These projections indicate that emissions in the area are estimated to show moderate growth through 2015. The estimate of mobile and area source emissions through the maintenance period is based on a similar moderate population growth. Projections of 2000 base year attainment inventories for mobile and area source emissions in the nonattainment area are included in Table 4.4 of this submittal. Area, mobile, and point source projections are illustrated in Figure 7.1. Chapter 4 contains detailed projection information for all sources. Projections indicate an estimated 31 percent increase of total emissions from all source categories through 2015 from 2000 base year levels. However, projected emissions are less than four percent higher than 1999 attainment year levels. Because the attainment emissions inventories demonstrate a stringent level of protection of ambient air quality, and modest growth from attainment year inventories is estimated for total source emissions, once redesignated, the area is projected to continue to exhibit a margin of safety protective of the SO_2 NAAQS.

Figure 7.1 - Hayden Nonattainment Area SO_2 Emissions Projections



7.2 Ambient Monitoring

Continued operation of an appropriate air quality monitoring network is required to verify the attainment status of the area. To comply with the requirements of this maintenance plan, ADEQ and ASARCO, commit to continue monitoring ambient SO_2 concentrations for at least 10 years following the approval of this SIP and maintenance plan. ASARCO will continue to calibrate, maintain, and operate SO_2 ambient monitoring equipment that meets EPA protocol at the Montgomery Ranch, Jail, Garfield Avenue, Hayden Junction and Globe Highway sites. The ambient SO_2 monitoring equipment operated by ASARCO may be shutdown if the facility has not operated for more than 24 consecutive months. Ambient SO_2 measurement is required to resume at all facility operated sites three months prior to restarting of smelting operations. To ensure adequate representation of ambient air quality, ADEQ will continue to calibrate, maintain, and operate the SO_2 monitoring equipment at the Jail site through the maintenance period.

Any changes in monitor location that may be indicated due to future changes in conditions will be discussed with EPA Region IX prior to final decisions. All ambient monitoring data will continue to be quality assured to meet the requirements of 40 CFR 58, Ambient Air Quality Surveillance. Data will also continue to be entered into EPA's *Aerometric Information Reporting System* (AIRS) database in accordance with federal guidelines.

In addition, ASARCO will continue to monitor ambient temperatures, and wind speed and direction for at least 10 years following the approval of this SIP and maintenance plan. ASARCO will continue to calibrate, maintain, and operate ambient meteorological equipment at the

Montgomery Ranch, Hayden Junction, and Globe Highway locations with the contingency that the meteorological equipment may be shutdown if the smelting facility has not operated for more than 24 consecutive months. Meteorological measurement is required to resume at these sites three months prior to restarting of smelting operations.

7.3 Verification of Continued Attainment

ADEQ anticipates no relaxation of any of the already implemented control measures used to attain and maintain the ambient air quality standards. ADEQ commits to submit to EPA Region IX any changes to its rules or emission limits applicable to SO_2 sources as a SIP revision. ADEQ also commits to maintain the necessary resources to actively enforce any violations of the rules or permit provisions contained in this submittal.[45]

Permitted sources are subject to the monitoring and reporting, and certification procedures contained in AAC R18-2-306 and AAC R18-2-309 respectively. ASARCO submits all certifications and reports as required by the above provisions (See **Section 4.3.1**). ADEQ has authority pursuant to ARS §49-101 *et seq.* to monitor and ensure source compliance with all applicable rules and permit conditions.

When ADEQ identifies a violation of any applicable permit requirement either through an inspection or records submitted to ADEQ, a decision will be made whether to issue a notice of opportunity to correct, a notice of violation, an administrative order, or to seek injunctive relief, and/or seek civil penalties. This decision will be made based upon the following considerations:

1. Risk to human health, safety, welfare or the environment;
2. The violator's indifference to the law;
3. The violator's previous compliance history.

Every notice of violation from ADEQ includes the following elements:

1. The factual nature of the violation.
2. The legal authority regarding compliance.
3. A description of what constitutes compliance and how it is to be documented.
4. A time frame in which ADEQ expects compliance to be achieved. Time frames shall require compliance at the earliest possible date.
5. An offer to meet.
6. A statement of consequences.

If violations are not corrected within 120 days from receipt of the notice of violation, the facility is required to enter into a consent order or an executed agreement for a consent decree and a compliance schedule. Measures for addressing violations of the NAAQS are provided in the contingency plan (See **Section 7.4**).

7.4 Contingency Plan

This contingency plan provides a procedure to ensure future compliance and promptly correct any violation of the SO_2 NAAQS that may occur after redesignation of the area to attainment. Contingency measures do not have to be fully implemented at the time of redesignation. The assurance that the contingency procedures outlined in this plan will be followed and commitments will be implemented and enforced is contained in state law at ARS §49-402 and §49-404 (See

[45] See **Appendix A** for ADEQ Organizational Chart.

Appendix A). Because the ASARCO smelting facility is the major source of SO_2 emissions in the nonattainment area, the contingency measures presented in this section focus primarily on ambient impacts of emissions attributable to this facility. Contingency measures for all other point sources are provided by the Prevention of Significant Deterioration (PSD) requirements contained in AAC R18-2-403 and AAC R18-2-406.[46]

A first occurrence in a calender year of a verified 3-hour average SO_2 level in excess of 0.425 ppm but less than 0.5 ppm (greater than 85 percent of the secondary NAAQS but less than 100 percent) shall require notification as described in the procedures below. The protective trigger level (PTL) is a second occurrence in a calender year of a verified 3-hour average SO_2 level in excess of 0.425 ppm but less than 0.5 ppm (greater than 85 percent of the secondary NAAQS but less than 100 percent) or any occurrence of a verified 3-hour average SO_2 level in excess of 0.5 ppm (100 percent of the secondary NAAQS), recorded at any ambient monitoring station. If the PTL is exceeded, there will still be time to complete all necessary facility inspections and technical evaluations, develop recommendations, and implement necessary mitigation measures to prevent any violation of the SO_2 NAAQS. Multiple exceedances (either spatially or temporally) shall be considered a single event during an episode. For this SIP, an episode commences at the time that the first exceedance begins and an episode shall conclude at the end of the 3-hour period following the last exceedance that can be attributed to the same cause. Special Measures described below for a second occurrence in a calender year of a verified 3-hour average ambient SO_2 level over 0.5 ppm (a violation of the secondary NAAQS), provide added protection to prevent a violation of the air quality standards.

7.4.1 Notification Procedure

ASARCO will record the hourly concentrations for all facility operated ambient monitoring sites. ADEQ will record the hourly concentrations for the state operated ambient monitoring site. For the ASARCO operated SO_2 monitors, the facility responsible official must notify ADEQ as soon as practicable, but no later than the close of the next business day after initially verified monitoring data indicate that an ambient SO_2 level in excess of 0.425 ppm has been recorded. For the ADEQ operated SO_2 monitor, ADEQ must notify the ASARCO responsible official as soon as practicable, but no later than the close of the next business day after initially verified monitoring data indicate that an ambient SO_2 level above 0.425 ppm. The facility will also have access to ADEQ's data.

7.4.2 First Action Level

These actions must be completed as soon as practicable, but no later than 24 hours following an event and should include at a minimum:

1. A full calibration check of the ambient SO_2 analyzers and recording systems, and review of all applicable records of environmental conditions and electrical supply at the monitor at the time of the exceedance. Final validation will be based on current EPA and ADEQ quality assurance guidelines,
2. Inspection of all ductwork and hooding associated with the flash furnace process and fugitive gases and the converter process and secondary hood gases,
3. Assessment of the acid plant to ensure that this facility is operating within parameters recommended by the manufacturer for optimal performance within the New Source Performance Standards limits, and
4. Inspection of all other processing equipment.

[46] State regulations comply with the federal requirements found in: 40 CFR 51.307 (NSR); 40 CFR 51.166 (PSD).

If it is determined that the exceedance of the PTL or NAAQS was due to invalid ambient monitoring data no further action is necessary.

In the event of a valid exceedance, ASARCO will, as soon as feasible, perform any needed repairs or corrective maintenance actions as evidenced by the assessment, including if necessary, cessation of facility operations.[47] The following preventive measures shall also be implemented:

1. Walk through inspections and maintenance of emissions collection, control, and process equipment, shall be increased from bi-weekly to weekly for the 12 month period following an exceedance of the PTL.[48] These inspections shall be targeted to the cause of the exceedance.
2. Should another exceedance of the PTL or NAAQS occur at any time within the ensuing 12 month period, the frequency of walk through inspections shall be increased to daily for the 12 month period following that exceedance. Daily inspections targeted to the cause shall continue for the 12 month period following any subsequent exceedances.

By the close of the second business day following an exceedance of the PTL, ASARCO will submit a report to ADEQ citing the nature of the event, any corrective actions or repairs undertaken to resolve the event, and recommendations for future corrective actions including specific milestones to avoid recurrence of such event. Any future repairs or corrective action taken must be reported to ADEQ within three working days after the repair or action is done. If the cause of the event has been resolved to ADEQ's satisfaction, no further action by ASARCO is necessary.

7.4.2(a) Analysis of Gas Handling Procedures

A condition representing abnormal conditions of plant operations was identified on or about October 5, 2001, via several incidents of high SO_2 3-hour averages at the Jail monitoring location. After a plant operation data analysis, higher than average flow of process gases, from the flash furnace and converters, to the acid plant was discovered. This trend was only detectable at times of single converter operation because the Hayden facility normally operates at full acid plant capacity.

After a complete external facility inspection, and failure to find any deficiencies, the Process Control Department discovered a variance in the acid plant Electrostatic Precipitator (ESP) discharge temperature. The ESP discharge end was inspected for leaks, and corrosion-induced holes in steel enclosures were found. Upon closure of the leaks, a long-range plan was developed to prevent corrosion leaks in the future. Preservation of temperature and maintaining process gas temperatures above the dew point is crucial for preventing corrosion. Sections #2 and #4 of the acid plant ESP have been isolated, and are only used for reserve or back-up. This has helped maintain ESP discharge temperatures and volume to the acid plant. As a final action to prevent leaks, the ESP discharge temperature is monitored to track performance. Volume and temperature monitoring have also been incorporated into internal best practices.

ASARCO has added additional standard operating procedures to address any potential problems. These additional procedures involve the following:

1. Management will provide for constant monitoring of processes to insure normal conditions, particularly in the flash furnace gas handling system, converter gas handling system and the acid plant system.
2. All employees will aid in this effort by recognizing abnormal processes and visual

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[47] For an exceedance to be valid, the data needs to be quality checked/quality (QA/QC) assured by the owner/operator of the monitor reporting the exceedance

[48] Current maintenance procedures are described in ASARCO's Title V permit.

conditions, and reporting incidents to supervisors or appropriate management personnel to insure internal best practices are met to insure compliance with the ambient SO_2 standard.

3. Once an abnormal condition is identified, current operating status will be logged and a cause and effect analytical process will be launched to find a resolution.
4. If an abnormal condition results in a protective trigger level exceedance, the ASARCO Environmental Department will be notified within 8 hours, and the data will be verified and reported to ADEQ within 24 hours.
5. If physical malfunctions cannot be found, a further assessment to identify engineering or operating problems will be performed by management and the Process Control Department.
6. The entire process will be documented and on file for review if requested by ADEQ or EPA.

7.4.3 Second Action Level

Should a triggering of the PTL occur and not be found correctable by actions previously described, an analysis shall be performed to identify additional mitigation measures needed to ensure maintenance of the ambient air quality standards. Additional contingency measures considered for implementation may include:

1. Additional operating procedures consistent with good air pollution control practices,
2. Additional emissions collection and control technology,
3. Application of operating rate/process parameter limitations,
4. Further decreasing stack and/or fugitive emissions limits, and
5. Any other measures necessary to protect and maintain the NAAQS.

ASARCO's assessment and recommendation of the above measures shall be reported to ADEQ within 30 business days following a triggering of the PTL. No later than 90 business days following receipt of ASARCO's assessment and recommendations, and using all available data, ADEQ will make a determination regarding the cause and appropriate resolution of the event and shall require the adoption and implementation of additional control measures, if needed, to ensure that the SO_2 NAAQS will not be violated. ADEQ commits to initiating any required revisions to rule or permit as soon as possible. The addition of permanent control measures will be made by SIP revision following the required public participation.

The selection of measures will be based upon emission reduction potential, cost-effectiveness, economic and social considerations, or other factors that ADEQ deems appropriate. The addition of permanent control measures will be made by SIP revision following the required public participation. Failure of ASARCO or the State of Arizona and its agencies to implement control measures necessary to maintain the SO_2 NAAQS may be considered a failure to fulfill the obligations of this plan.

7.4.4 Special Measure

The following operational change shall be implemented within 24 hours of a monitored violation of the secondary NAAQS:

Processing of new concentrate shall not exceed the rate as calculated by the following formula:

S/AC * APR = Operating Rate

Where:
S = 3-hour standard (1300 ug/m^3);
AC = actual maximum 3-hour average concentration recorded during the exceedance period (ug/m3); and
APR = average processing rate of new concentrate during the three hour exceedance period (tons/hour).

ASARCO shall also comply with the First Action Level requirements and, if necessary, the Second Action Level requirements. Within the same calender year, should a second and higher concentration exceedance of the secondary NAAQS be recorded following implementation of the Special Measure, the operating rate shall be recalculated accordingly. The Special Measure shall remain in effect until the facility has identified any source of emissions contributing to ambient SO_2 concentrations above the secondary NAAQS and has remedied the cause. If the violation can be attributable to an upset or malfunction the source may continue regular production while it submits a report within 24 hours detailing any repair or resolution.

Conclusion:

As detailed above, and in Chapter 5, the continuation of the SO_2 NAAQS will be maintained during the next ten years.

8.0 REFERENCES

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