FINAL

MIAMI
SULFUR DIOXIDE NONATTAINMENT AREA
STATE IMPLEMENTATION
AND
MAINTENANCE PLAN

AIR QUALITY DIVISION

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

June 2002
(Revised May 26, 2004)

TABLE OF CONTENTS

(*Final Miami Sulfur Dioxide Nonattainment Area State Implementation and Maintenance Plan, Air Quality Division, Arizona Department of Environmental Quality, June 2002*, errata on pages 2, 3, 4, and 49 corrected 5/26/04.)

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

1.1 Executive Summary

This document is an attainment demonstration, maintenance plan, and formal request to the United States Environmental Agency (EPA) to redesignate the Miami, Arizona area, a nonattainment area for sulfur dioxide (SO_2), 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 3** of this document shows that ambient air quality monitors located in the Miami nonattainment area have recorded no violations of the primary SO_2 NAAQS or secondary SO_2 NAAQS since 1985. 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 Miami, Arizona. The 2000 base-year Miami nonattainment area emissions inventory, presented in **Chapter 4**, lists the sources in the nonattainment area and their SO_2 emissions. Details regarding the updated modeling demonstration are contained in **Chapter 5**. **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 Miami.

Chapter 7 describes in detail measures designed to ensure continued maintenance of the SO_2 NAAQS for at least ten 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 Miami 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]

[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.

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

Areas that do not meet the NAAQS may be designated nonattainment for the respective standard. The Miami SO_2 nonattainment area initially comprised all of Gila County (43 FR 8968, March 3, 1978) but, the boundaries were subsequently reduced to nine townships in and around Miami (44 FR 21261, April 10, 1979). In addition, six adjacent townships were designated as unclassified. The current boundaries of the nonattainment and unclassified areas, as shown in Table 1.1, are codified at 40 CFR 81.303.

Table 1.1 - Current Study Area Definition (corrected 5/26/04)		
Miami Area Description	**Does Not Meet Primary Standards**	**Cannot Be Classified**
T2N, R14E	X	
T2N, R15E	X	
T1N, R13E[3]	X	
T1N, R14E	X	
T1N, R15E	X	
T1N, R16E	X	
T1S, R14E[3]	X	
T1S, R14 1/4E	X	
T1S, R15E	X	
T2N, R13E[3]		X
T2N, R16E		X
T1S, R13E[4]		X
T1S, R16E		X
T2S, R14E[4]		X
T2S, R15E		X

[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 (two exceedances of a standard per year is a violation of that standard).

[3] Only that portion in Gila County.

At this time, the State of Arizona requests the area boundaries be revised to accurately reflect the air shed and remove tribal lands because the State has no jurisdiction over sources on tribal lands. EPA approval of the boundary revision and redesignation to attainment of the Miami area will not change applicable regulations in the excluded area or in any other way adversely impact the effectiveness or enforceability of the applicable SIP.

The Arizona Department of Environmental Quality (ADEQ), formally requests, pursuant to CAA Section 107(d)(3)(D), that the Miami SO_2 area boundary be revised to add the following to the current study area definition as defined in 40 CFR 81.303: T1N, R15 ½ E (does not meet primary standards) and T2N, R15 ½ E (unclassifiable); and the following be removed from the current study area definition: that part of T1N, R16E that is San Carlos Indian Reservation land (See **Figure 1.1** for location map of the current and proposed boundaries and Table 1.2 for a description of the current and proposed township boundaries).

Table 1.2 - Proposed Modified Study Area Definition **(corrected 5/26/04)**

Miami Area Description	Does Not Meet Primary Standards	Cannot Be Classified
T2N, R14E	X	
T2N, R15E	X	
T1N, R13E[4]	X	
T1N, R14E	X	
T1N, R15E	X	
T1N, R15 1/2E[5]	**X**	
T1N, R16E[6]	**X**	
T1S, R14E[7]	X	
T1S, R14 1/2E	**X**	
T1S, R15E	X	
T2N, R13E[7]		X
T2N, R15 1/2E		**X**
T2N, R16E		X
T1S, R13E[7]		X

4 Only that portion in Gila County.

5 Additional area ADEQ requests to add to the nonattainment area.

6 Only that portion not in the San Carlos Indian Reservation.

7 Only that portion in Gila County.

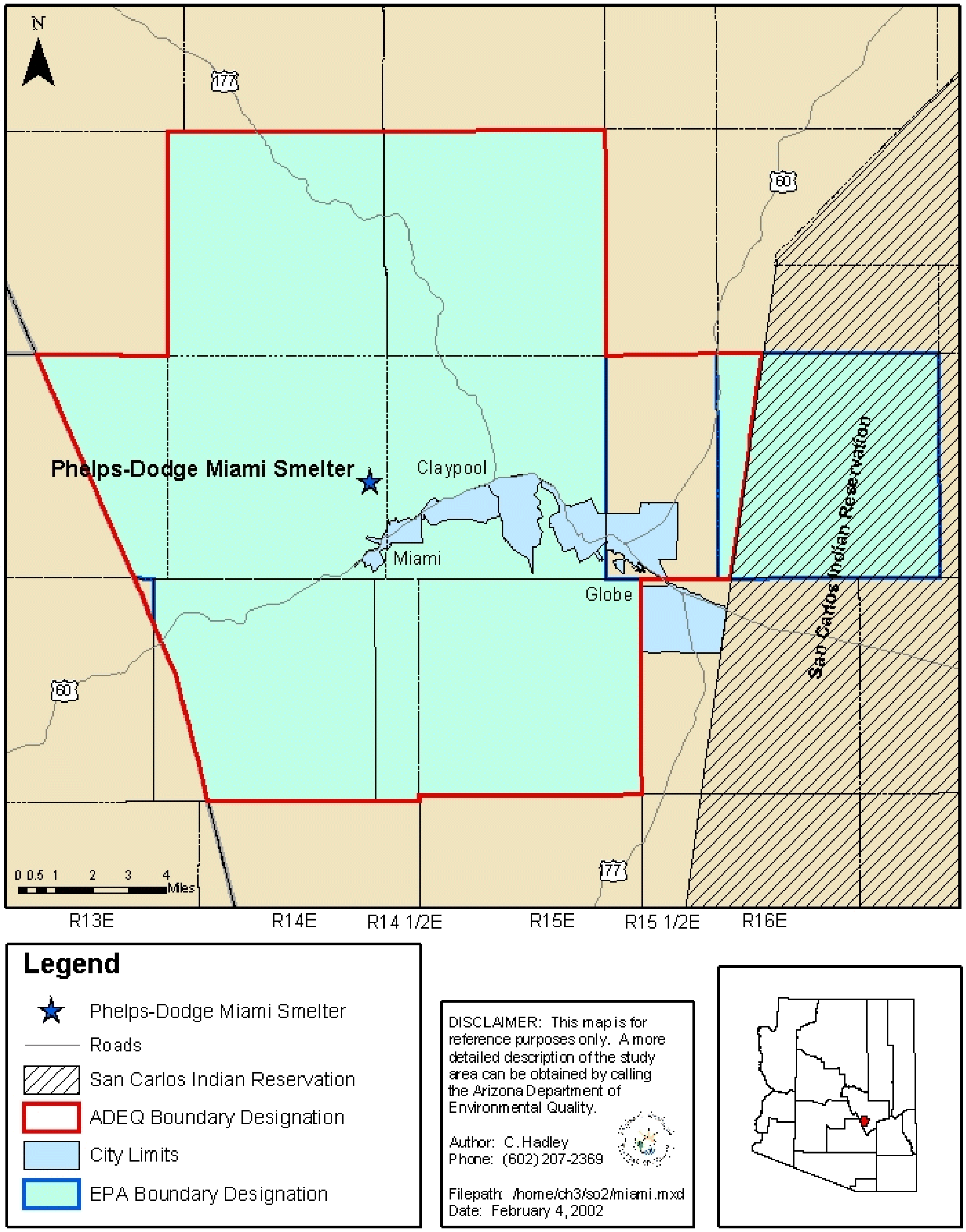
Table 1.2 - Proposed Modified Study Area Definition (corrected 5/26/04)		
Miami Area Description	**Does Not Meet Primary Standards**	**Cannot Be Classified**
T1S, R16E		X
T2S, R14E[7]		X
T2S, R15E		X

The relationship between major SO_2 point sources and ambient air quality is relatively well-defined. Emission inventories demonstrate that the Phelps-Dodge Miami smelter comprises 99 percent of total SO_2 emission in the nonattainment area (See **Chapter 4**).[8] The primary copper smelter is located northeast of the town of Miami, in the unincorporated area of Claypool, Gila County, Arizona; at latitude 33°24' 50" N and longitude 110°51' 25" W, at an elevation of 3,595 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

[8] In 1984, ownership of the smelter transitioned from Inspiration Mining Corp. to Cyprus Miami Mining Inc. and in 1999, to Phelps-Dodge Miami Inc., who maintains current ownership and operation.

Figure 1.1 Miami SO_2 Nonattainment Area



on ambient monitoring data, the smelters could intermittently curtail emissions to meet the SO_2 NAAQS. EPA disapproved this approach and required installation and operation of SO_2 emissions controls at all times to adequately 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 Ammendments, however, modified smelter control requirements to allow the temporary use of SCS while the ultimate SO_2 emission limits were developed and also allowed certain smelters additional time for 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.[9]

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 Miami 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.

To meet clean air act requirements applicable to smelters, the Miami facility in 1974, replaced its reverberatory furnace with an electric furnace, installed Hoboken converters to replace Pierce Smith converters, and installed a sulfuric acid plant to treat off gases from these vessels. These changes allowed the facility to come into compliance with the MPR regulations when they became effective. The MPR rules, which established stack emission limits for the smelters, were approved by EPA on January 14, 1983 (48 FR 1717). The Miami smelter came into full compliance with the MPR regulations by 1984. Since that time, the Miami facility has implemented improved process and control technology. An IsaSmelt® furnace and 528 ton per day oxygen plant were installed, as well as an upgrade of the existing double contact acid plant for treatment of process gas SO_2.[10] On August 27, 1991, Cyprus Miami Mining, Incorporated, (predecessor to Phelps-Dodge Miami Inc.) submitted to ADEQ a study to partially fulfill outstanding SIP commitments for analysis of fugitive emissions. The study was implemented to describe SO_2 fugitive emission units and provide an estimate of fugitive emissions during typical smelter operation.

Subsequently, in 2001, Phelps-Dodge Miami Inc. conducted a further ambient impact analysis of maximum actual emissions (both stack and fugitive) in relation to resulting ambient concentrations. Based on this analysis, a 2002 rulemaking revised the SO_2 emission limits in Arizona Administrative Code (AAC) R18-2-715 and R18-2-715.01 (See **Appendix A**). The new limits include stack and total emission limits and 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.

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[9] 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).

[10] See **Chapter 6.0** for a more detailed description.

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

1.3.1 Climate and Physiography

Both desert terrain and mountain ranges are found within Gila County's landscape. Elevations range from near 2,000 to more than 7,000 feet above sea level in the nonattainment area with the town of Miami situated at an elevation near 3,400 feet. This unique environment experiences both warm desert and cool alpine climates. In Miami, the hottest month of the year is July, when the average daily maximum temperature is 97° Fahrenheit (F). January is the coolest month with an average daily minimum temperature of 35° F.

Precipitation generally occurs in two seasons. The wettest month in Miami is August when monsoonal thunderstorms produce an average monthly total of 3.33" (inches) of rain. Pacific winter storms moving across the area in December produce monthly average of 2.40" of precipitation in the form of rain or snow. The driest month is May, with an average of 0.25" of rain. The average yearly precipitation is 18.00".

1.3.2 Population

Miami, a historic copper mining center, is located along U.S. Highway 60 in a steep canyon in the Pinal Mountains of southern Gila County. Miami is 80 miles southeast of Phoenix and 112 miles northeast of Tucson. Directly to the east of Miami is Globe, the County's second largest city and the Gila County seat.[11]

The population of Miami declined from 3,394 in 1970 to 1,936 in 2000. This represents a population loss of 43 percent compared to Gila County's growth rate of more than 75 percent. In the 1970s, during which rural counties in the U.S. outpaced urban counties in population growth, the population of Miami declined 20 percent, contrasted to the growth in Gila County at almost 27 percent. During the 1980s, the population growth of Gila County significantly slowed to about one-third of its growth during the previous decade. Miami, however, continued to lose population at an even greater rate during the 1980s. Then, during the 1990s, when Gila County's growth exceeded its growth during the 1970s, the population of Miami seemed to have stabilized with a loss of only 4.1 percent. Decennial U.S. Census data for the Miami area and for Gila County are shown in Table 1.3.

Table 1.3 - Decennial Census Population of the Miami area and Gila County: 1970-2000				
Year	**April 1, 1970**	**April 1, 1980**	**April 1, 1990**	**April 1, 2000**
Miami	3,394	2,716	2,018	1,936[12]
Miami's decennial change		-20.0%	-25.7%	-4.1%
Globe	7,333	6,886	6,062	7,486

[11] Payson, located in north central Gila County, is the largest city with a 2000 Census population of 13,620.

[12] The 2000 Census shows a population of 1,936 with 930 housing units of which 754 are occupied (18.9 % vacant). The number of occupied housing units equals the number of households residing in Miami with 2.57 persons per household. Miami has no group quarters population.

Table 1.3 - Decennial Census Population of the Miami area and Gila County: 1970-2000				
Year	**April 1, 1970**	**April 1, 1980**	**April 1, 1990**	**April 1, 2000**
Globe's decennial change		-6.1%	-12.0%	23.5%
Claypool	2,245	2,362	1,942	2,214
Claypool's decennial change		5.0%	-22.0%	12.0%
Central Heights	2,289	2,791	2,969	3,313
Central Heights decennial change		18.0%	6.0%	10.0%
Gila County	29,255	37,080	40,216	51,335
Gila County's decennial change		26.7%	8.5%	27.7%

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

Arizona Department of Economic security (DES) population estimates are the official statistics for the state and differ slightly from the 2000 Census population counts. Table 1.4 portrays the projected growth of Miami, Globe, and Gila County in five-year increments from 2000 to 2015. According to DES data, Miami is expected to grow slightly at a rate of about 2 percent, while Globe's growth rate is expected to be higher at about 10 percent. In comparison, Gila County is expected to grow just over 18 percent during this same time period. The population of Miami is projected to be flat during this time period, compared to Gila County's projected growth rate of 18.5 percent during this 15-year time period.

Table 1.4 - Population Projections for Miami, Globe, and Gila County: 2000-2015				
Year	**July 1, 2000**	**July 1, 2005**	**July 1, 2010**	**July 1, 2015**
Miami	2,063	2,079	2,094	2,110
Globe	7,568	7,841	8,107	8,378
Claypool	2,214	2,215	2,216	2,217
Central Heights	3,313	3,436	3,556	3,681
Gila County	48,614	51,644	54,603	57,613

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

1.3.3 Economy

Gila 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 holds one percent of county land; individual and corporate ownership accounts for 4.1 percent of the land area; Indian reservations cover 38 percent; the U.S. Forest Service, Bureau of Land Management, and other Federal Agencies hold approximately 56.9 percent combined. Gila County is a great source of mineral wealth. Silver originally attracted settlers to the area, but as the silver resources were depleted, copper was mined.

In general terms, economic activity in Gila County is divided into tourism in the north where Payson is located and into mining and related activities in the south where Miami and Globe are located. In addition, ranching comprises a significant portion of the area's economy. Miami also is a gateway to recreational areas, such as Roosevelt Lake and Tonto National Monument.

Retail trade and various service industries play a vital role in the local economy. According to the Arizona Department of Revenue, taxable sales, for example, have increased from $6,869,400 in 1990 to $8,771,267 in 1999. With increasing popularity of this area, demands for lodging, restaurants, retail businesses, and other businesses are expected to heighten (See **Table 1.5** for economic activity in Gila County).

The major local employer in Miami has been Phelps-Dodge Corporation that operates open pit copper mines as well as smelting facilities. A second major employer in the Miami area was BHP Billiton, which operates underground and open pit mines. Table 1.5 shows a selected time series of civilian labor force data for the Miami nonattainment area.

Table 1.5 - Civilian Labor Force Data for Miami Nonattainment Area

Year	1990	1995	1998	1999	2000
Civilian Labor Force	754	6,805	6,552	6,363	6,125
Number Unemployed		1,924	1,715	1,618	1,251
Unemployment Rate	6.9%	7.3%	6.7%	6.6%	5.3%

Source: Arizona Department of Economic Security. Data represent annual averages. Numbers for 1999 and 2000 are preliminary.

Table 1.6 contains employment, expressed as percentages of total non-farm employees, for Gila County for 1994, 1997, and 2000. This table also includes a selected time series of civilian labor force data. Even though the labor force has been declining, the unemployment rate has declined somewhat since 1990. Approximately 20 percent of the labor force is related to mining and copper production.

Table 1.6 - Economic Activity in Gila County by Number of Employees: 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

Table 1.6 - Economic Activity in Gila County by Number of Employees: 1994, 1997, and 2000			
Economic activity	**1994**	**1997**	**2000**
Mining and quarrying	900	325	700
Construction	800	900	1,050
Manufacturing	1,600	1,675	1,075
Trans., Communication and Pub. Utilities	400	525	500
Trade	3,100	3,500	3,325
Finance, Insurance and Real Estate	300	225	275
Services and misc.	2,700	2,800	2,575
Government	3,000	4,400	4,725

Source: Derived from Arizona Department of Economic Security data.

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, in the following section, set forth the following requirements for 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."

Phelps-Dodge, the primary source of SO_2 emissions in the Miami nonattainment area, succeeded in implementing RACM/RACT at levels sufficient to attain the NAAQS for SO_2, going beyond the required technology to increase the facility's efficiency in capturing and treating SO_2. RACT for SO_2 emission controls for a smelting furnace include:

1. Wet Scrubber,
2. Minimization of Leaks,
3. Hooding and venting of gases to the stack, and

4. Contact Sulfuric Acid Plant.

Chapter 6 contains further explanation of applicable RACM/RACT for the Phelps-Dodge 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 Miami nonattainment area has obtained 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. All non-permitted source emissions data (ie: mobile sources) is obtained from EPA's national emissions inventory.[13] Base-year emissions 2000 and projected emissions (2015) are contained in Chapter 3.

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 AAC, Title 18, Chapter 2, Articles 3 and 4. All new major sources and major 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, Standards of Performance Primary Copper Smelters, Site Specific Requirements, contains the required annual average emission limitations and number of three-hour average emission limits for the Phelps-Dodge smelter.[14] 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. Details regarding emissions limitations and control measures for all SO_2 sources in the nonattainment area may be found in Chapter 4.

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[13] 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

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

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.

(Chapter 2 includes monitoring network information and data for the Miami area.)

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 the organization chart for ADEQ's Air Quality Division.

Under ADEQ's air permits program, stationary sources that emit regulated pollutants in significant quantities 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 annual fees to recoup the costs of administering a permit 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 for major sources. 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.[15] ADEQ is responsible for the preparation and submittal of an emissions inventory report to EPA for major sources and emission points prescribed in 40 CFR 51.322, and for sources that require a permit under ARS §49-426 for criteria pollutants.

Under ADEQ's air quality compliance program, scheduled and unscheduled inspections are conducted at the major sources 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 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."

Multi-Point Rollback modeling was used with EPA's concurrence to establish emissions limits for the Phelps-Dodge smelter and updated 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 obtained, 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

[15] "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 Miami SO_2 nonattainment area. With the submittal of this SIP and Maintenance Plan, ADEQ requests redesignation of the Miami 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 Miami, Gila 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 Miami, Gila 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 are applicable to dryer, roaster, smelting furnace, and copper converter equipment in primary copper smelters.[16] Any facility that commences construction or modification after October 16, 1974, is subject to the requirements of this subpart. The Miami smelter was modified in 1991/1992 when an IsaSmelt® furnace and oxygen plant were installed and upgrades to the acid plant were completed. ADEQ compliance, permit, monitoring, technical, and correspondence files indicate that the facility has complied with all the requirements of this subpart.

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

3.0 SO_2 MONITORING NETWORK

Monitoring began in the Miami area in 1970 by the State of Arizona.[17] Phelps-Dodge began continuous ambient SO_2 air quality monitoring in the late 1970's. An extensive monitoring network was established with sufficient spatial and temporal coverage to comprehensively evaluate the ambient impact of smelter emissions. More than sixteen stationary monitoring sites were established throughout the area with as many as seven monitors operating concurrently (See **Table 3.1** and **Figure 3.1**).[18] This ambient SO_2 network, comprised of EPA, State, and Phelps-Dodge 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	Period of Operation
Lower Miami[19]	1975-1982
Claypool	1970-1973
Inspiration	1973-1974
Fire Station	1974
Jones Ranch (state)	1974-1994
Jones Ranch	1981-present
Ridgeline - Linden St. (state)	1995-present
Bohme Ranch	1977
Ice House	1977
Miami City Services Building	1978-1989
County Landfill	1978-1982
Townsite	1981 - present
Burch	1981-1996
2 miles southeast of smelter[20]	1982-1989
Miami E	1971

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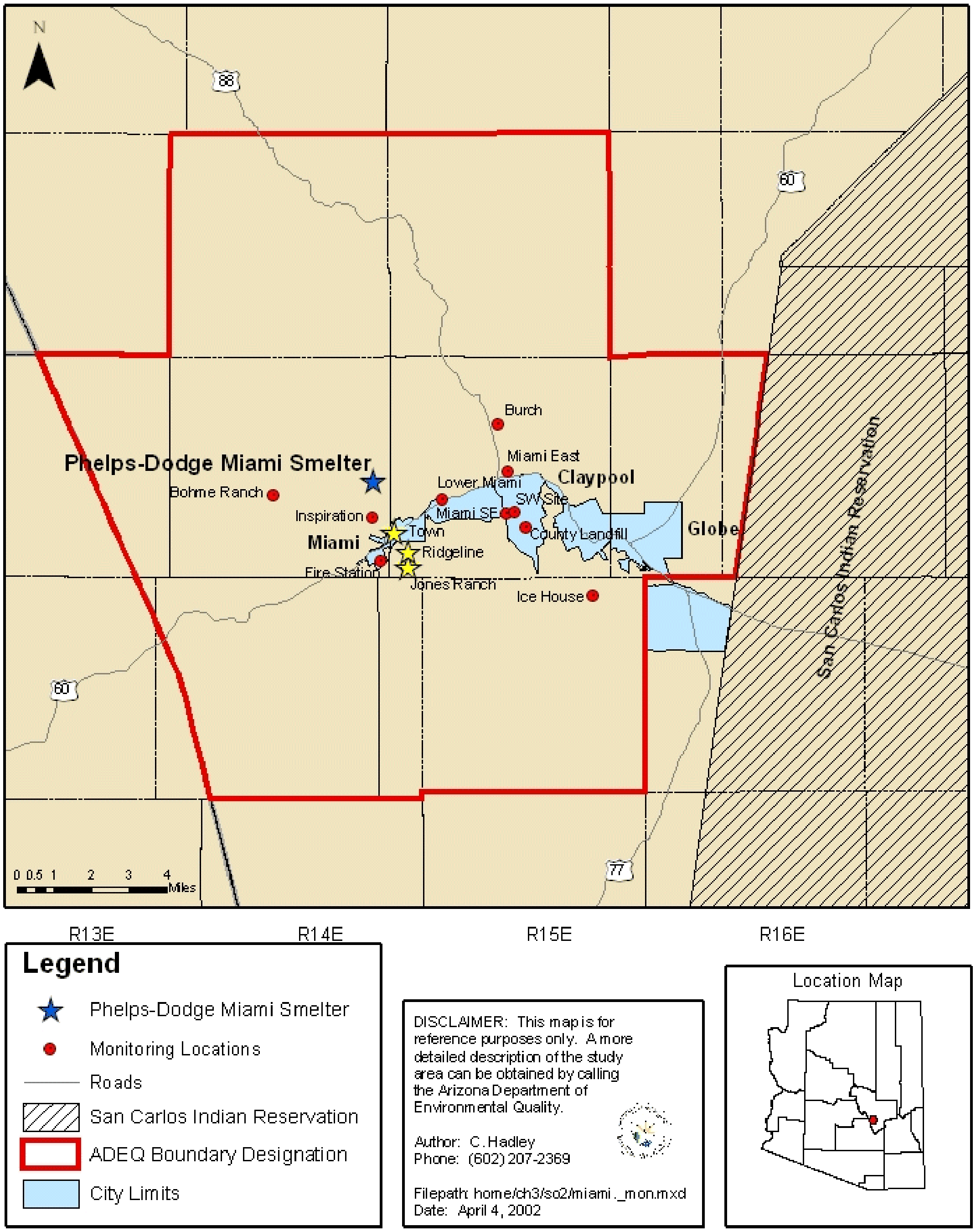
17 *Sulfur Dioxide Monitoring Network Study*, Arizona State Department of Health, Environmental Health Services, Division of Air Pollution Control, 1974.

18 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).*

19 AKA: George Washington School

20 AKA: Little Acres

Figure 3.1 Miami SO2 Nonattainment Area Monitor Locations



Additional installation of 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 in 1979 of the MPR rule that established stack emissions limits for the smelter based on permanent controls. Placement of additional monitors were established with EPA to further evaluate ambient impacts.

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

Table 3.2 - Current Monitoring Network

Unit[21]	Location	Elevation (feet above sea level)	Operator
Jones Ranch[22]	2.05 miles from smelter	4,094	Phelps-Dodge
Ridgeline	1.00 mile from smelter	3,560	ADEQ
Townsite	1.49 miles from smelter	3,390	Phelps-Dodge

3.1 Current Sampler Type and Siting

[21] The Jones Ranch, Ridgline, and Townsite monitors are combined stack and fugitive emissions impact sites.

[22] Ambient sulfur dioxide monitoring at Jones 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).

The two monitoring units operated by Phelps-Dodge are Thermo Electron pulsed fluorescent (TECO) Model 43A and 43B SO_2 analyzers. These SO_2 analyzers are interfaced to Phelps-Dodge Miami's data acquisition system by telemetry. The TECO analyzers measure in the 0-2 ppm range. Redundant recording systems are operated for all of the Phelps-Dodge 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. The Phelps-Dodge 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** on the following page illustrates the ambient SO_2 monitors that comprise the current Miami area network.

3.2 Ambient Data Analysis

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

1. There have been no recorded exceedances of the annual NAAQS for SO_2 since 1977 and annual averages are generally below 20 percent of the NAAQS;
2. There have been no recorded exceedances of the 24-hour NAAQS for SO_2 since 1985 and maximum 24-hour average SO_2 levels are generally below 40 percent of the NAAQS; and
3. There have been no recorded exceedances of the 3-hour NAAQS for SO_2 since 1987 and maximum 3-hour averages are generally below 70 percent of the NAAQS.

The nonattainment area has recorded more than eight, consecutive, quarters of quality assured, violation-free data from January 1999 through December 2000. Data for the current monitoring network is presented in Table 3.3.

Figure 3.2 Miami SO2 Nonattainment Area
Magnification of Monitor Locations

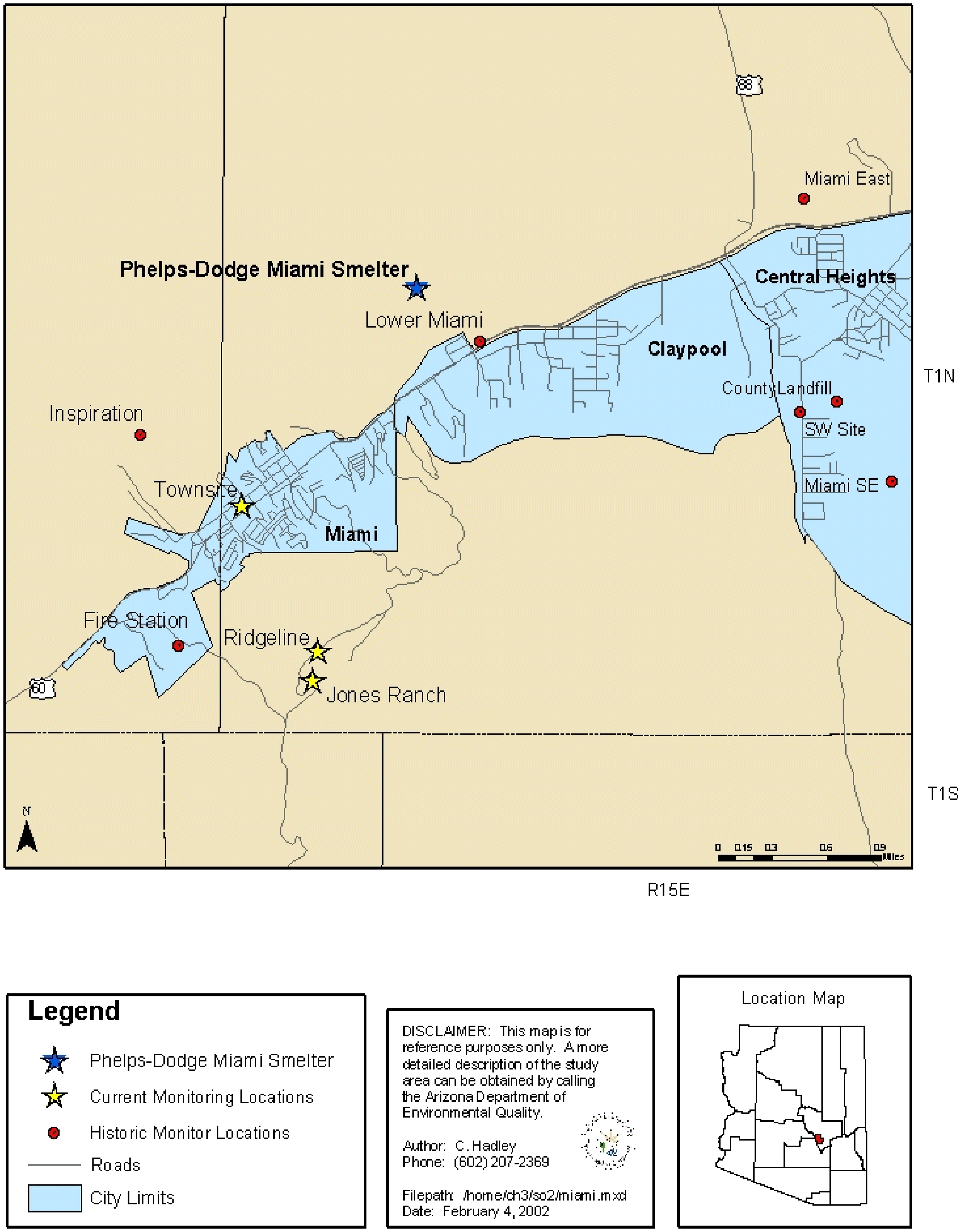


Table 3.3 - SO_2 Ambient Air Quality Monitoring Data (µg/m³)							
Year	**Annual Ave.**	**24-Hour Max**	**3-Hour Max**	**Number of Exceedances**			**No. of 1-hr. Samples**
				Annual (> 80 µg/m³)	**24-hr. (> 365 µg/m³)**	**3-hr. (> 1300 µg/m³)**	
Jones Ranch[23]							
2000	11	133	895	0	0	0	8554
1999	8	152	897	0	0	0	8582
1998	10	123	840	0	0	0	8738
1997	10	138	820	0	0	0	8750
1996	11	146	593	0	0	0	8774
1995	8	122	433	0	0	0	8760
1994	8	166	527	0	0	0	8760
1993	7	120	803	0	0	0	8760
1992	6	95	537	0	0	0	8760
1991	15	160	890	0	0	0	8760
1990	12	132	730	0	0	0	8760
1989	15	136	750	0	0	0	8760
1988	17	172	723	0	0	0	8760
1987	17	313	2073	0	0	1	8760
1986	17	150	540	0	0	0	8760
1985	36	368	2537	0	1	6	8760
1984	42	688	4637	0	4	12	8754
1983	31	350	5139	0	1	6	7450
1982	76	991	7556	0	17	33	8370
1981	76	1084	6177	0	9	22	8614
1980	30	563	3993	0	5	11	8584
1979	79	1501	7394	0	17	46	8596
1978	64	985	4565	0	2	2	8012

[23] Data prior to 1984 was recorded at the state operated Jones Ranch monitor.

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data ($\mu g/m^3$)							
Year	**Annual Ave.**	**24-Hour Max**	**3-Hour Max**	**Number of Exceedances**			**No. of 1-hr. Samples**
				Annual (> 80 $\mu g/m^3$)	**24-hr. (> 365 $\mu g/m^3$)**	**3-hr. (> 1300 $\mu g/m^3$)**	
Jones Ranch, con't[24]							
1977	84	1285	5737	1	2	2	8071
1976	56	767	4450	0	2	2	8044
1975	51	2642	8900	0	2	2	8061
1974	170	1785	5992	1	10	19	1096[25]
Ridgeline							
2000	16	70	309	0	0	0	8423
1999	13	65	200	0	0	0	8264
1998	8	40	175	0	0	0	8347
1997	5	92	524	0	0	0	8082
1996	8	110	338	0	0	0	7972
1995	10	89	244	0	0	0	7972
Townsite							
2000	8	76	483	0	0	0	8776
1999	8	72	263	0	0	0	8754
1998	2	28	210	0	0	0	8739
1997	3	57	417	0	0	0	8748
1996	5	65	360	0	0	0	8776
1995	6	56	280	0	0	0	8760
1994	4	42	273	0	0	0	8760
1993	4	58	237	0	0	0	8760
1992	4	52	383	0	0	0	8760
1991	5	64	453	0	0	0	8760
1990	4	54	430	0	0	0	8760
Townsite, con't							

[24] Data prior to 1984 was recorded at the state operated Jones Ranch monitor.

[25] Monitor was in operation part of the year.

Table 3.3 - SO_2 Ambient Air Quality Monitoring Data (μg/m^3)							
Year	**Annual Ave.**	**24-Hour Max**	**3-Hour Max**	**Number of Exceedances**			**No. of 1-hr. Samples**
				Annual (> 80 μg/m^3)	**24-hr. (> 365 μg/m^3)**	**3-hr. (> 1300 μg/m^3)**	
1989	7	61	387	0	0	0	8760
1988	9	64	513	0	0	0	8760
1987	14	70	493	0	0	0	8760
1986	17	100	260	0	0	0	8760
1985	20	270	1690	0	0	1	8760
1984	29	360	2083	0	0	1	8784
1983	12	423	3320	0	1	1	5304
1982	30	790	3380	0	4	11	N/A
1981	45	360	1800	0	0	3	N/A

4.0 SO_2 EMISSIONS INVENTORY FOR POINT, AREA AND MOBILE SOURCES

Emissions inventories from all sources in the Miami nonattainment area indicate that although there are other sources of SO_2 emissions, the Miami smelter is the primary source for SO_2 emissions and comprises more than 99 percent of total SO_2 emissions 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 Miami 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.

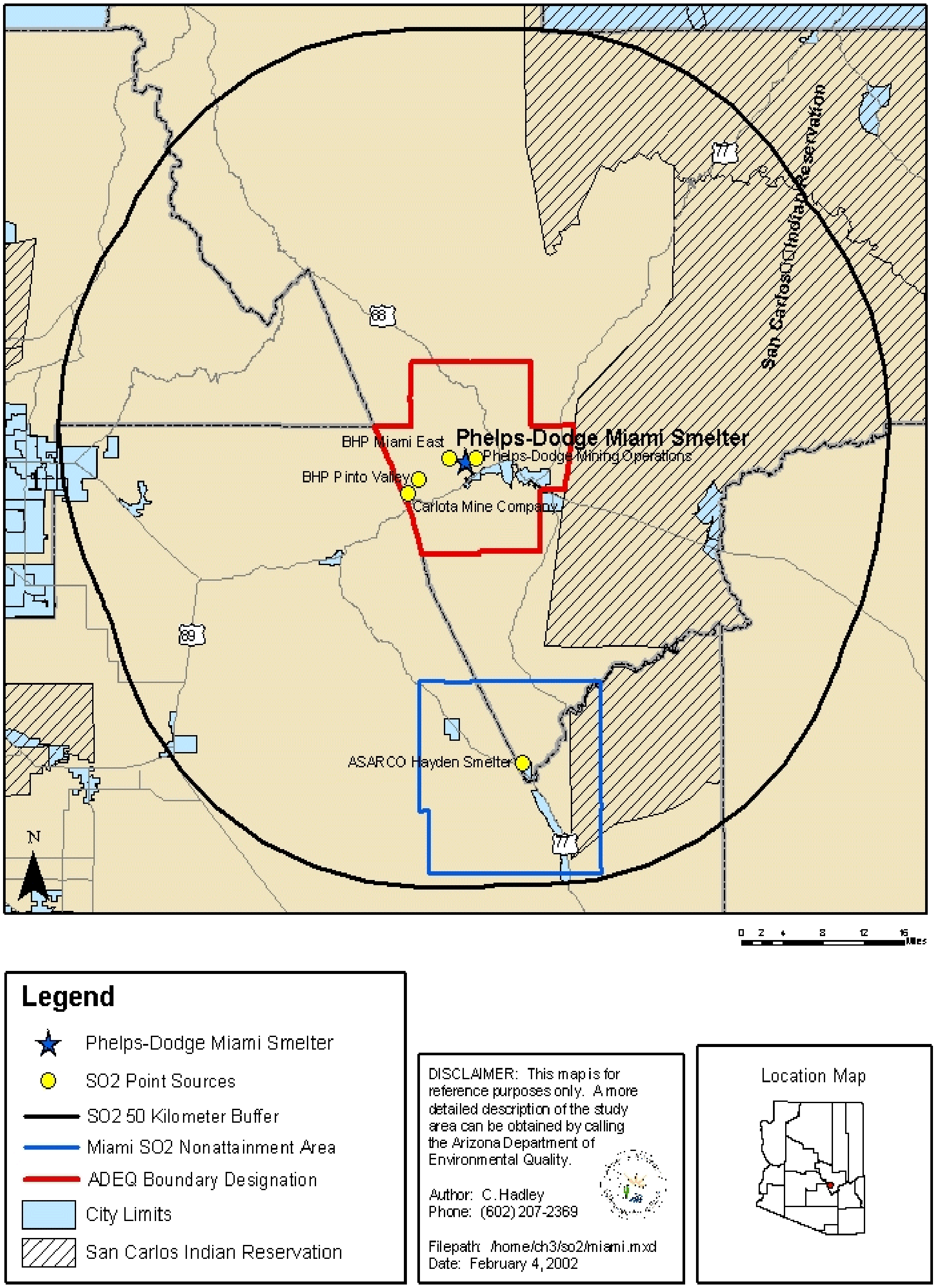
4.1 SO_2 Point Sources within the Miami nonattainment area

Five point sources are located within the Miami nonattainment area. Point source locations are illustrated in Figure 4.1. Attainment year inventories for these sources are presented in Table 4.1. Unless otherwise indicated, all 24-hour inventories are averages based on the number of operating hours for each respective year.

Table 4.1 - Actual SO_2 Emissions for Miami Nonattainment Area - Point Sources			
Source Name:		**1999**	**2000**
BHP Copper Pinto Valley Unit	**24 Hr. (tpd)**	< 1	< 1
	Annual (tpy)	< 1	<1
BHP Copper Miami Unit	**24 Hr. (tpd)**	< 1	< 1
	Annual (tpy)	< 1	<1
Carlota Copper Company	**24 Hr. (tpd)**	0	0
	Annual (tpy)	0	0
Phelps-Dodge Miami Mine	**24 Hr. (tpd)**	< 1	< 1
	Annual (tpy)	7	4
Phelps-Dodge Miami Smelting Operations[26]	**24 Hr. (tpd)**	22	21
	Annual (tpy)	7,819	6,810
24 Hour Total (tpd):		**< 23**	**< 22**
Annual Total (tpy):		**7,826**	**6,814**

[26] 24-hour inventories are a ton per day (tpd) average 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 Miami SO2 Nonattainment Area and Major Point Sources Within the 50 Kilometer Buffer



4.1.1 BHP Copper, Pinto Valley

An integrated copper production facility, BHP Copper, Pinto Valley, is an open pit sulfide ore mining and milling operation where copper sulphide ore is prepared for smelting and refining. Additional activities include, oxide ore heap leaching and solvent extraction-electrowinning operations. The primary source of SO_2 emissions from this facility are natural gas and diesel burning equipment that includes generators and boilers. Permits for the mine require the use of low sulfur diesel, natural gas or propane in the generators, and the potential to emit (PTE) for all existing equipment is 6.035 tpy when burning diesel, 0.08 tpy when burning natural gas, and 0.012 tpy when burning propane. Actual emissions, are minimal, at less than one tpy.

4.1.2 BHP Copper, Miami East Unit

This source is a mining and copper ore processing facility. The BHP Copper Miami Unit is an underground and open pit sulfide ore mining and oxide ore extraction operation. Currently production at the facility is limited to oxide ore solvent extraction-electrowinning operations. The primary source of SO_2 emissions from this facility are natural gas burning equipment that includes boilers. The permit for the mine requires the use of low sulfur natural gas and limits the potential emissions from all existing equipment to 0.03 tpy of SO_2.

4.1.3 Carlota Copper Company Mine

This proposed facility is expected to include three open pits, three mine rock storage areas, a primary and secondary crusher, and a solvent extraction-electrowinning facility. Mine operations will include drilling, blasting, loading, transport, extraction and stripping of the mined ore. The primary source of SO_2 emissions form this facility will be from burning diesel fuel in generators and a boiler. The total PTE for this facility is 1.22 tpy. The permit limits the hours of operation for the generator engines (438 hrs/yr.), the boiler (6,000 hrs/yr.) and the process rate for the entire facility (125,000 tpd and 22 MM tpy).

4.1.4 Phelps-Dodge Miami Mine

The Phelps-Dodge Miami Mine is a mining and copper ore processing facility that includes open pit oxide ore extraction operations. Currently production at the facility is limited to oxide ore solvent extraction-electrowinning operations. The primary source of SO_2 emissions from this facility are natural gas and diesel burning equipment that includes regular and emergency generators and boilers.[27] The permit for the mine lists potential to emit as 1.77 tpy when burning natural gas, 227.5 tpy when burning fuel oil with less than 0.5% sulfur content, and 24.09 tpy when burning fuel oil with less than 0.05% sulfur content.[28] Potential SO_2 emissions are listed at 149 tpy for boilers and 2.8 tpy for tankhouses, although actual emissions, are minimal, at 7.0 tpy. The permit, however,

[27] Per EPA policy for emergency generators, emission calculations are based on 500 hours of operation, and this is considered the "worst-case" scenario for use in one year.

[28] As the calculations indicate, when burning fuel oil #2 (.5% sulfur content), there is a potential for SO2 emissions to be higher than the major source threshold of 100 tpy. This means that while burning this fuel oil, the source could potentially trigger major source permitting requirements. To avoid this, the source has voluntarily accepted facility-wide emissions limitations and separate limit for the boilers.

limits SO_2 emissions to 74.33 tpy for boilers and limits emissions from all existing equipment to 92.13 tpy.

4.1.5 Phelps-Dodge Miami Smelter

Smelting and refining of copper ore at Phelps-Dodge Miami's primary copper smelter produces copper cathode as well as byproducts of the smelting process (sulphuric acid and precious metals) for sale to customers. Copper rod is also produced at this location in a rod plant. Based on 2000 emissions data, the majority of this facility's emissions are from the following stack and fugitive units: acid plant tail gas stack; vent fume stack; emergency stack; and fugitive emissions from the IsaSmelt® and electric furnace, converters, and anode refining. The maximum allowable annual average SO_2 emission rate for stacks was reduced from 3,163 lbs/hr to 604 lbs/hr with recent revisions to AAC R18-2-715(F). The revisions also limited annual average emissions for combined stack and fugitive units to 2,420 lbs/hr or 10,368 tpy.[29]

In addition, the permit limits sulfur content and usage rates for fuel used in all fuel burning equipment. Emissions units and rates for Phelps-Dodge Miami smelter are detailed in Appendix B.

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 Miami nonattainment area. There is no information to suggest that emissions from these sources have contributed to the same levels of SO_2 in the nonattainment area as the Miami smelter or that emissions from these sources could cause violations in the Miami nonattainment area. Attainment year inventories are provided in Table 4.2. The 24-hour inventories are a ton per day (tpd) average calculated by dividing the annual facility emissions by the number of operating days for each year.

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

Source Name:		**1999**	**2000**
ASARCO Hayden Smelter[30]	**24 Hr. (tpd)**	58	47
	Annual (tpy)	21,081	15,934
24 Hour Total (tpd):		**58**	**47**
Annual Total (tpy):		**21,081**	**15,934**

4.2.1 ASARCO Hayden Smelter

29 The original permit calculated the annual average limits based on 357 days of operation.

30 24-hour inventories are a ton per day (tpd) average calculated by dividing the annual facility emissions by the number of operating days for each year.

The Hayden primary copper smelter is located 46 kilometers south of the Miami smelter and is geographically separated from the Miami area by the 7,000 foot Pinal Mountains. The Hayden facility operates a flash 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 33,498 tpy. Actual emissions, however, are less than 23,000 tpy. In addition, the permit limits sulfur content and usage rates for fuel used in all fuel burning equipment. The ASARCO smelter is located in the Hayden SO_2 nonattainment area. A separate State Implementation and Maintenance Plan is being developed for the Hayden SO_2 nonattainment area and will include further details regarding this source. ADEQ anticipates submittal of the SIP to EPA in 2002.

4.3 Area, Mobile, and Total Sources

Emissions for the nonattainment area were derived from EPA NET area and mobile source inventories for Gila County based on the assumption that area and mobile source emissions are proportionate to population levels. The Miami SO_2 nonattainment area population is estimated to be thirty-one percent of the Gila County population based on the aggregate population centers of Globe, Central Heights-Midland CDP, Claypool CDP and Miami. The remainder of the nonattainment area has a very low population density with low traffic levels and minimal commercial or industrial development.[31] Data shows that there are no urban areas that might be significant area or mobile sources located within the Miami 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 - Actual SO_2 Emissions for Miami Nonattainment Area - All Sources

Source Type:[32]		**1999**	**2000**
Area and Mobile[33]	**24 Hr. (tpd)**	< 1	< 1
	Annual (tpy)	149	150
Point	**24 Hr. (tpd)**	< 23	< 22
	Annual (tpy)	7,826	6,814
24 Hour Total (tpd):		**< 24**	**< 23**
Annual Total (tpy):		**7,975**	**6,964**

4.4 Emissions Projections

Arizona does not anticipate any substantial increase in existing point source emissions

31 See **Section 1.3.2** for a more detailed explanation of population data.

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

33 24-hour inventories are averages based on a 365 day distribution of emissions from these sources.

between 2000 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 international competition has resulted in a consolidation of the copper industry in the Southwestern United States. Consequently, no expansion of the industry is expected though 2015.[34] The remaining sources have existing permits limiting their potential to emit to less than 100 tpy. 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.[35]

Table 4.4 -Projected SO_2 Emissions for Miami Nonattainment Area - Point Sources

Source Name:		1999	2000	2005	2010	2015
BHP Copper, Pinto Valley Unit	24 Hr. (tpd)	< 1	< 1	< 1	< 1	< 1
	Annual (tpy)	< 1	< 1	< 1	< 1	< 1
BHP Copper, Miami Unit	24 Hr. (tpd)	< 1	< 1	< 1	< 1	< 1
	Annual (tpy)	< 1	< 1	< 1	< 1	< 1
Carlota Copper Company[36]	24 Hr. (tpd)	0	0	< 1	< 1	< 1
	Annual (tpy)	0	0	1.22	1.22	1.22
Phelps-Dodge Miami Mine[37]	24 Hr. (tpd)	< 1	< 1	< 1	< 1	< 1
	Annual (tpy)	7	4	8	8	8
Phelps-Dodge Miami Smelting Operations[38]	24 Hr. (tpd)	22	21	23	23	23
	Annual (tpy)	7,819	6,810	8,000	8,000	8,000
24 Hour Total (tpd):		**< 23**	**< 22**	**< 24**	**< 24**	**< 24**

34 The Annex is expected to be approved by EPA at the end of 2002.

35 All 24-hour inventory projections are calculated based on the average number of operating hours for the attainment period.

36 Projections are based on potential to emit (PTE) limits as the facility currently does not exist.

37 Projections are based on historical, fully operational rates.

38 The annual number of operating days used to calculate the projected 24-hour inventories for 2005 through 2015 (annual emissions divided by the number of operating days) were based on average operating conditions. The average number of operating days for the period 1999 through 2000 were assumed to represent typical operating rates.

Table 4.4 -Projected SO_2 Emissions for Miami Nonattainment Area - Point Sources					
Source Name:	**1999**	**2000**	**2005**	**2010**	**2015**
Annual Total (tpy):	**7,826**	**6,814**	**8,009**	**8,009**	**8,009**

Table 4.5 - Projected SO_2 Emissions within 50km of the Miami Nonattainment Area - Major Point Sources						
Source Name:		**1999**	**2000**	**2005**	**2010**	**2015**
ASARCO Hayden Smelter[38]	**24 Hr. (tpd)**	58	47	66	66	66
	Annual (tpy)	21,081	15,934	23,000	23,000	23,000
24 Hour Total (tpd):		**58**	**47**	**66**	**66**	**66**
Annual Total (tpy):		**21,081**	**15,934**	**23,000**	**23,000**	**23,000**

4.4.2 Area, Mobile, and Total Source Projections

ADEQ projects emissions of SO_2 from area and mobile sources to grow proportionately with the population of the nonattainment area. Appendix B describes the source category emissions projections in greater detail.[39] Table 4.6, on the following page, presents projected area and mobile, and total source emissions for the Miami nonattainment area.

Table 4.6 - SO_2 Emissions Projections for Miami Nonattainment Area - All Sources						
Source Type:		**1999**	**2000**	**2005**	**2010**	**2015**
Area and Mobile	**24 Hr. (tpd)**	<1	<1	<1	<1	<1
	Annual (tpy)	149	150	154	158	162
Point	**24 Hr. (tpd)**	< 23	< 22	< 24	< 24	< 24
	Annual (tpy)	7,826	6,814	8,009	8,009	8,009
24 Hour Total (tpd):		**< 24**	**< 23**	**< 24**	**< 24**	**< 24**
Annual Total (tpy):		**7,975**	**6,964**	**8,163**	**8,167**	**8,171**

39 See **Section 1.3.2** for a more detailed analysis of population data.

5.0 MODELING DEMONSTRATION

Attainment is demonstrated through the clean ambient air quality record of more than ten years and use of Multi-point rollback (MPR) modeling. The improvement in air quality is due to continuous SO_2 emissions process and control technologies implemented by the Miami smelter to comply with the SO_2 emission limits regulations adopted for Arizona smelters in September 1979. 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 SO_2 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 Miami smelter, the 3-hour standard was the most conservative limiting standard which, is also protective of the 24-hour and annual standards.[40]

Because hourly emissions were not available in 1976, the original MPR analysis used an estimate of hourly SO_2 emissions over the course of a year, based on knowledge of smelter operations and emissions variability, to construct an emissions curve. The entire curve was then "rolled-back" and the resultant distribution 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 Jones Ranch monitor (a stack and fugitive impact site) for the period December 1975, through November 1976, were used and average emissions for the same period were calculated by sulfur balance.

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. In addition to evaluation of stack emissions, Section 5.1.2 includes analysis of ambient impacts due to facility-wide emissions including both stack and

[40] A detailed discussion of Multipoint Rollback methodology is contained in *Ultimate Sulfur Dioxide Emission Limits for Arizona Copper Smelters, September, 1979.*

fugitives. Data from January 1999 through December 2000, are used in the current demonstration and include continuous measurement data for stack, calculated fugitive SO_2 emissions, and measured ambient concentrations. These data were used to establish new stack and facility-wide emission limits in rule that are demonstrated to maintain emissions at a level protective of the ambient air quality standards (See **Appendix A**).

At the time of the original analysis, knowledge of fugitive emissions was lacking and for this reason it was not possible to make estimates of either the amount of fugitives or their impact on ambient air quality. It should be noted, however, that for the Miami smelter, stack emissions are from a relatively low level and it is not possible to segregate contributions from fugitive and non-fugitive emissions. With the subsequent installation of continuous emissions monitoring systems for stacks, stack emissions can now be quantified. The revised limits provide control for separate stack emissions and total emissions.

5.1.1 Stack Emissions Limits

The new SO_2 limits for stacks at the Miami 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 actual hourly SO_2 emission 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 (1999-2000) 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 Miami 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 concentration) to maintain future emissions at a level protective of the NAAQS.

Two years of data, based on actual stack emissions measurements from January 1999 through December 2000, were used in the current analysis to determine a new 3-hour average emissions profile and annual average for stacks. 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 creating a new database of 8,760 hourly values for the attainment period. The highest 3-hour average emission value for the calculated emissions profile was 4,090 lbs/hr. The second highest 3-hour value in the emissions profile was 3,373 lbs/hr. A maximum 3- hour average emission for the new profile (4,959) was then calculated by multiplying 4,090 lbs/hr by the ratio of 4,090/3,373. The highest 26 percent, or 2,240 hours, of the resulting averages were then sorted into 24 categories of cumulative frequency of occurrence values identical to the occurrence limits in the MPR tables (0 to 2,240). The emission values for each category of cumulative frequency of occurrence were selected, where in each category of allowed emission occurrences, the lowest actual emissions value in that range was used to establish the new emissions level. For example, the **n** cumulative frequency of occurrence where **n = 7** in the new MPR table for stack emissions corresponds to the emissions value **E** where **E = 2,328**. The measured emissions values that occur in the frequency, where **n = 7**, are **2,418, 2,358** and **2,328.** The method of selecting the cumulative occurrence and 3-hour average emission limits is outlined in **Appendix C**.

The annual average emissions value for stacks was determined from the calculated numerical average of the combined hourly stack emission values for the attainment period (January 1999 through December 2000). Table 5.1 illustrates the new stack emissions profile based on actual emissions for the period.

Table 5.1 - Miami 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 lbs/hr (E)
0	4959
1	4090
2	3373
4	2614
7	2328
12	1988
20	1724
32	1470
48	1206
68	973
94	835
130	728
180	654
245	608
330	580
435	553
560	533
710	512

Table 5.1 - Miami 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 lbs/hr (E)**
890	492
1100	473
1340	456
1610	437
1910	422
2240	407
Annual Average lbs/hr	
	345

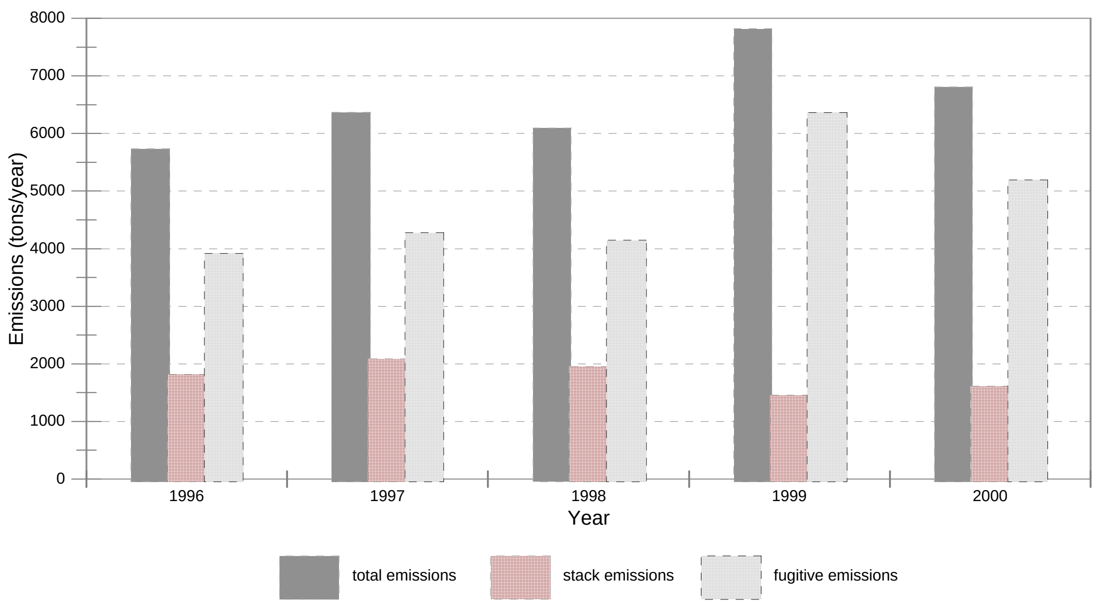
Because the ambient air quality standards have been met in the Miami area by a substantial margin, the next step in the analysis entailed selection of an adjustment factor to adjust the 2002 emissions curve, calculated from actual emissions from the attainment period, to a new level that continues to maintain the NAAQS.

Stack emissions at this smelter are released from a relatively low level and comparatively near the fugitive release height. Emissions from stack and fugitive sources are mixed shortly after release and are often combined as they disperse through the atmosphere. Because of the similarity in release heights, it is impossible to segregate the contributions of stack and low level fugitive emissions on ambient concentrations. While the individual stack and fugitive impacts are not explicitly defined, it is reasonable to evaluate the combined impacts of stack and associated fugitive emissions. A current permit provision limits overall annual average emissions to 2420 lbs/hr based on a twelve month (365 day) rolling average. This level of control has been shown to be protective of air quality in the Miami area (See Chapter 3). The smelter has continued to operate within these limits. However, as stack emissions measurements are now available, it is possible to determine the contribution of stack emissions to overall facility emissions levels. Therefore, it is a valid approach to estimate the numerical relationship between stack and fugitive emissions based on recent sulfur balance data and measurement data and use that relationship to divide the overall 2420 lbs/hr limit into components representative of stack and fugitive emissions. The existing permit limit and the current stack contribution to total emissions are the basis for determining an adjustment factor for the new stack emissions profile.

Stack emissions are measured by continuous emissions monitoring systems. Fugitive emissions are calculated by material balance for sulfur. Calculated and measured emissions from 1996 through 2000 show that stack emissions have ranged from 19 to 33 percent of total facility emissions over the last five years. A comparison of stack, fugitive, and total emissions is presented in Table 5.2 and illustrated in Figure 5.1.

Table 5.2 Miami Smelter Emissions					
Emissions Source	**1996**	**1997**	**1998**	**1999**	**2000**
Stack	1820	2090	1952	1458	1616
Fugitive	3917	4278	4145	6361	5193
Total	5737	6368	6097	7819	6810
Stack/Total	32 %	33 %	32 %	19 %	24 %

Figure 5.1: Miami Smelter SO_2 Emissions



Recent emissions inventories have shown that stack emissions are about one quarter of facility-wide emissions. In 2000, total emissions were 6,809 tons with fugitives comprising 5,193 tons and stacks 1,616 tons. Stack emissions were 23.7 percent of the total emissions for this year. This value is well within the range of observed data and below the five year average of 28 percent. The percentage of 2000 stack emissions was rounded to 25 percent for ease of calculation and used to determine a stack portion of the total emission limit of 2420 lb/hr. A similar percentage of the total emission limit is calculated as follows:

$$\textbf{2420 lb/hr x 0.25 = 604 lb/hr} \qquad (1)$$

The calculated annual average emissions for the attainment period is 345 lb/hr (See Table 5.1) and differs from the stack portion of the emission limit by a factor of 1.75. The ratio of the calculated value in equation 1 to the annual average for the attainment period in Table 5.1 is shown in equation 2 below:

$$\frac{\mathbf{604\ lb/hr}}{\mathbf{345\ lb/hr}} = \mathbf{1.75} \qquad (2)$$

This factor is the basis for "rolling up" the 3-hour average stack emissions and the annual average stack emissions derived from attainment period data (See Table 5.1). The adjusted values become the new MPR 3-hour average and annual average limits for stack emissions as illustrated in Table 5.3. The new limits are within the existing permitted limit and representative of current stack contributions to overall emissions. The revised stack limit becomes the stack component of the overall facility limit of 2420 lbs/hr. These new stack limits are contained in a 2002 rulemaking and will be incorporated in a future permit revision (See **Appendix A**).

Table 5.3 - Miami Smelter MPR Stack Emissions Limits

Number of Cumulative Occurrences (n)	3-hr Average Emissions (lbs/hr) Based on Continuous Emissions Data From July 1, 1999, through June 30, 2001 (E)	3-hr avg Emissions Limits (lbs/hr), Including 1.75 Adjustment Factor (E)
0	4959	8678
1	4090	7158
2	3373	5903
4	2614	4575
7	2328	4074
12	1988	3479
20	1724	3017
32	1470	2573
48	1206	2111
68	973	1703
94	835	1461
130	728	1274
180	654	1145
245	608	1064
330	580	1015

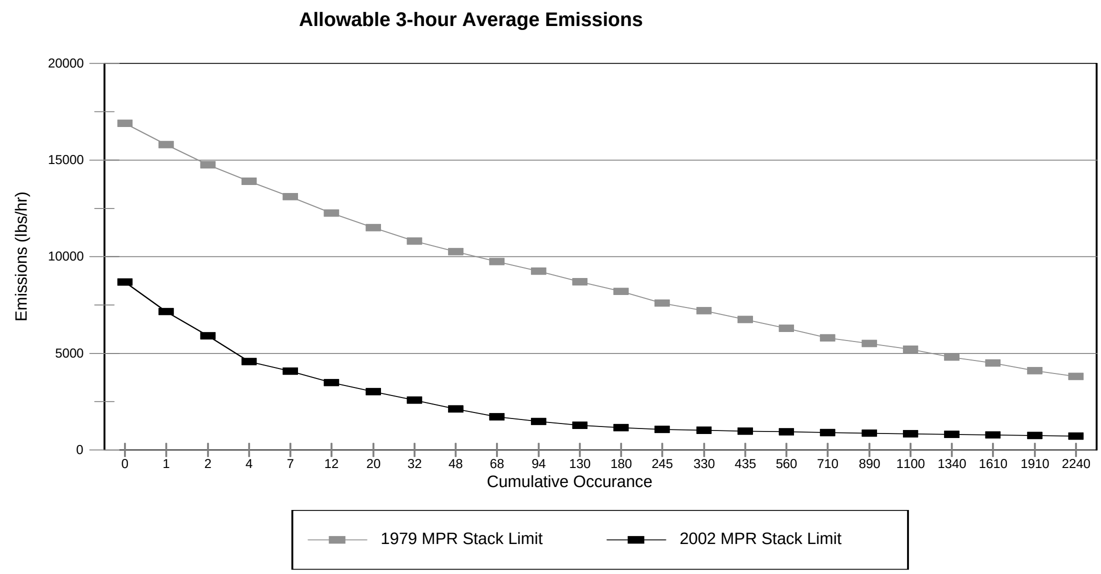
Table 5.3 - Miami Smelter MPR Stack Emissions Limits		
Number of Cumulative Occurrences (n)	**3-hr Average Emissions (lbs/hr) Based on Continuous Emissions Data From July 1, 1999, through June 30, 2001 (E)**	**3-hr avg Emissions Limits (lbs/hr), Including 1.75 Adjustment Factor (E)**
435	553	968
560	533	933
710	512	896
890	492	862
1100	473	828
1340	456	797
1610	437	765
1910	422	739
2240	407	712
Annual Average Emissions (lbs/hr)		
	345	604

5.1.2 Total Emission and Process Limits

In 1972, SO_2 emissions at the Miami smelter were 172,000 tons per year (tpy) or approximately 39,000 pounds per hour (lbs/hr). Between 1975 and 1980, subsequent to installation of an acid plant, emissions averaged 10,000 lbs/hr. In 1979, the MPR rule required annual average stack emissions to be rolled back to 3,163 lbs/hr or 13,854 tpy. The 1979 limits reduced emissions more than 150,000 tpy from 1975 levels. The subsequent 2002 rule revision reduced allowable annual average stack emissions to a lower level of 604 lbs/hr. The 2002 change in allowable emissions provides an annual reduction of 11,208 tons per year (approximately 81 percent of the 1979 rule limit) from stack sources alone. The corresponding reduction in allowable 3-hour average stack emissions is illustrated in Figure 5.2. In addition to the reduction in the stack limits, the 2002 analysis established a 2420 lbs/hr (10,368 tpy) facility-wide annual average SO_2 emission limit in rule.

Figure 5.2 - Comparison of 1979 and 2002 MPR Limits[41]

[41] Limits contained in AAC R18-2-715(F)(1) and (H).



The 2002 rulemaking incorporates the current permit provision that limits total emissions at the Miami smelter to 2420 lbs/hr based on a 12 month rolling average as well as the new MPR 3-hour limits (See Appendix A). Based on the assumption of a generally linear relationship between emission levels and ambient concentrations, potential ambient concentrations can be calculated based on the ratio of the actual and the allowable emission level. Ambient air quality concentrations are shown to remain below the NAAQS when the annual, second high 24-hour, and second high 3-hour average ambient concentrations recorded at the Miami area ambient monitors during 1996, through 2000, are increased by the ratio of the allowable annual average emission limit to the actual annual average emission for each respective year (i.e., adjustment factor = rule limit/actual emissions). This long term record necessarily includes the associated distribution of short term emissions that occur at these operating rates. A similar comparison using the ratio of the maximum allowable 3-hour average emission limit (stacks) to the actual maximum 3-hour average emission for the attainment period also shows the calculated ambient concentrations to remain below the NAAQS. Figure 5.3 illustrates the smelter annual average emissions from 1996, through 2000, and Figure 5.4 shows the calculated increase of ambient concentrations.

Figure 5.3 - Miami Smelter Total Emissions

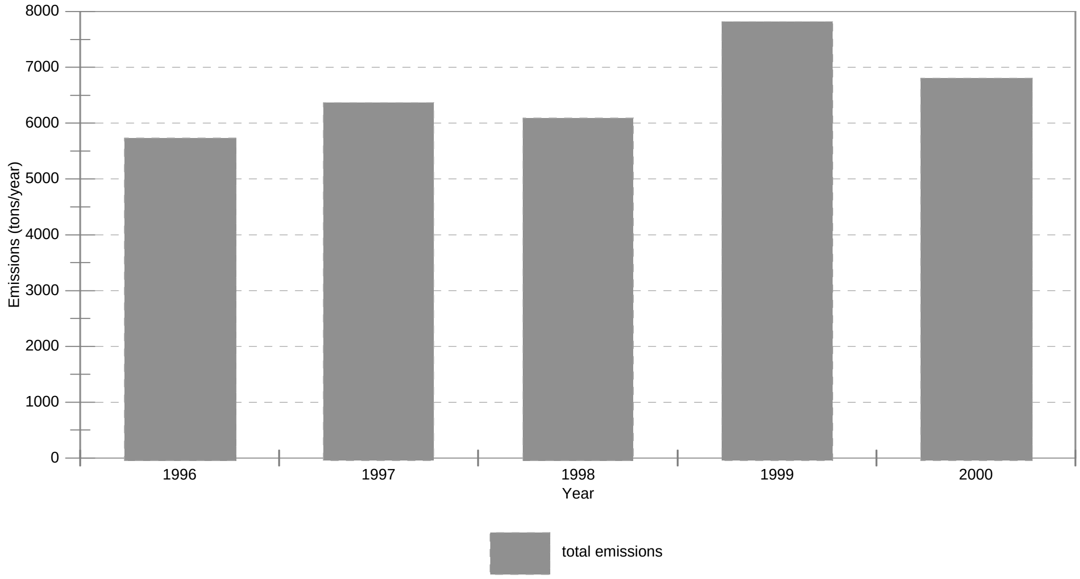
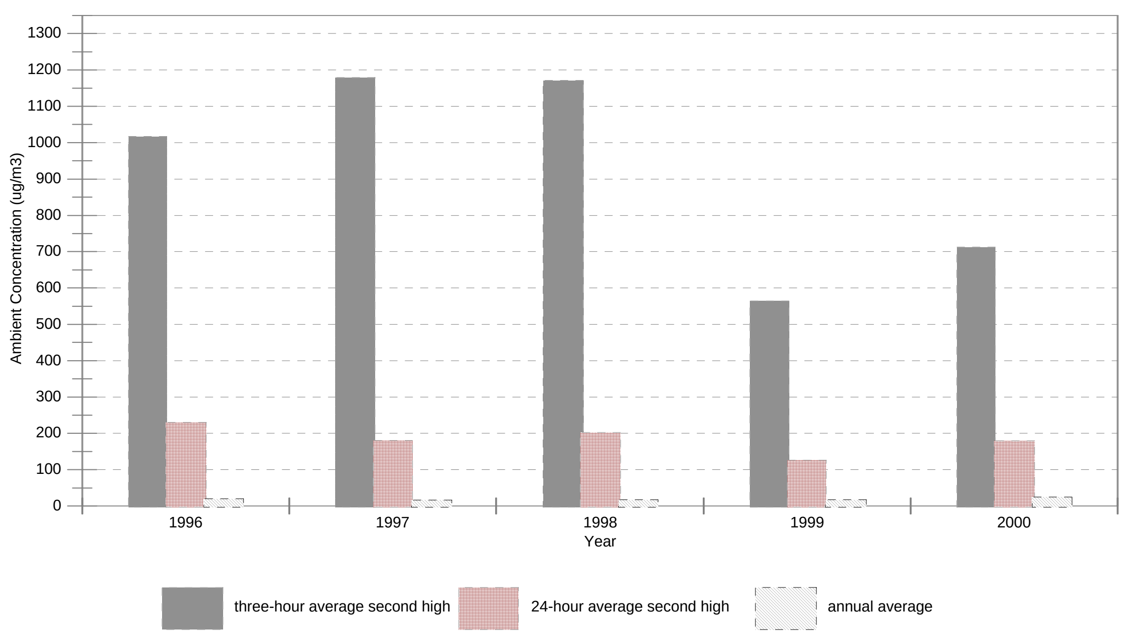


Figure 5.4 - Miami Smelter Ambient Concentrations
(adjusted based upon the ratio of the new rule limit to the actual emissions)



In addition, another permit provision limits processing of new metal bearing material at the Miami smelter to 850,000 tpy. The smelter has operated within this limit. Based on the similar assumption of a generally linear relationship between operating levels and ambient concentrations as well as an average 30 percent sulfur content, potential ambient concentrations can be calculated based on the ratio of the actual to the allowable process level. Ambient air quality levels are shown to remain below the NAAQS when the annual, second high 24-hour, and second high 3-hour ambient concentrations recorded at the Miami area ambient monitors during 1996, through 2000, are increased by the ratio of the allowable throughput to the actual throughput for each respective year (i.e., adjustment factor = allowable throughput/actual throughput). Figure 5.5 illustrates the smelter processing throughput from 1996, through 2000, and Figure 5.6 shows the calculated increase of ambient concentrations.

Figure 5.5 - Miami Smelter Process Rate for New Metal-Bearing Material

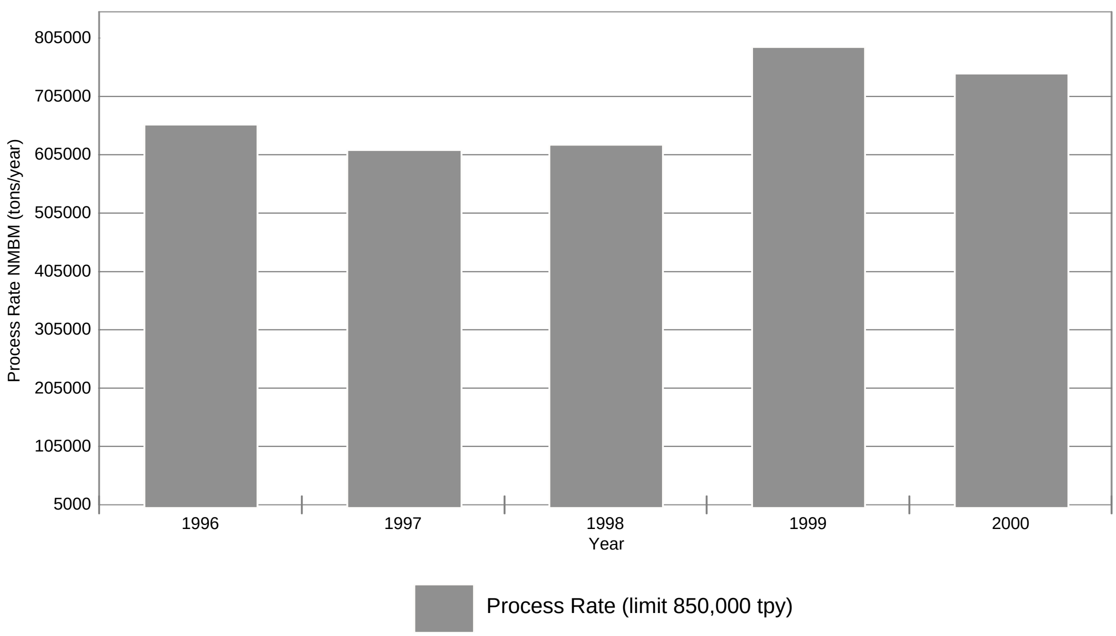
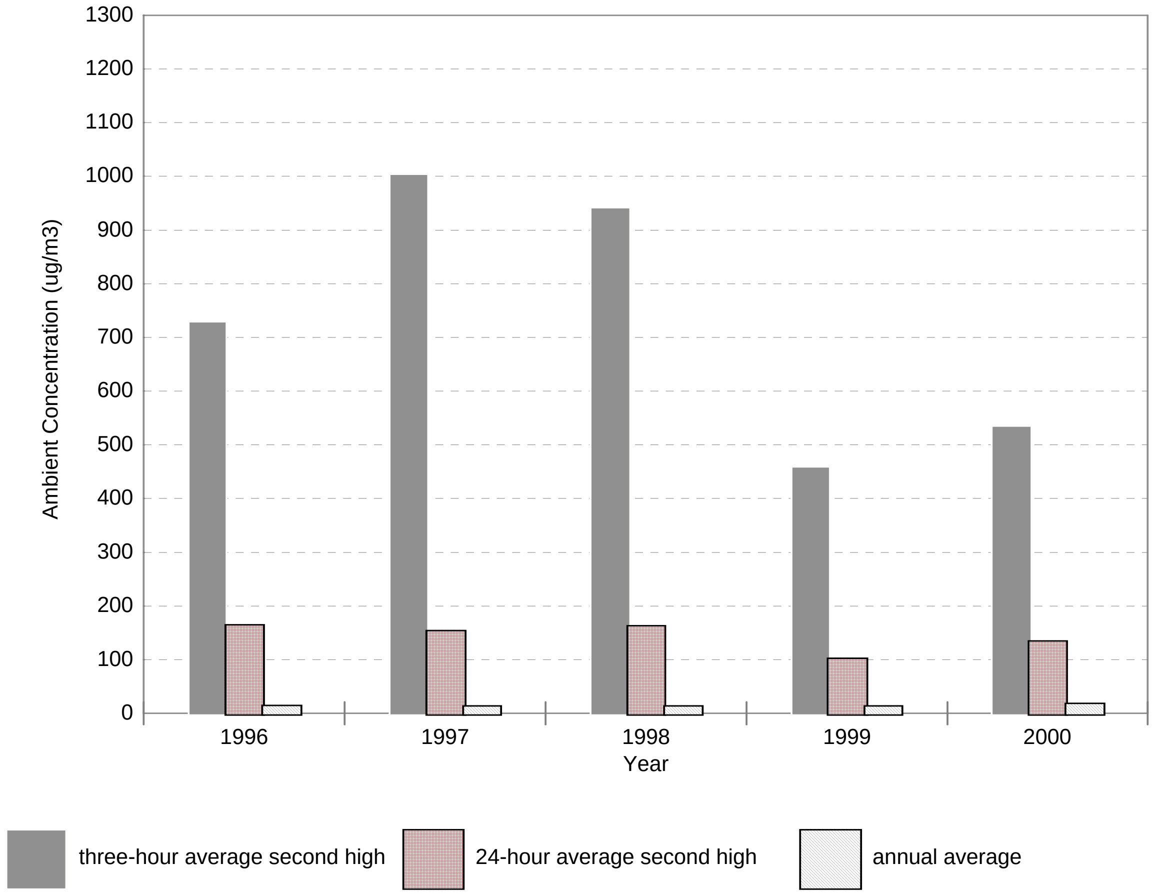


Figure 5.6 - Miami Smelter Ambient Concentrations (adjusted based upon the ratio of the processing limit to the actual processing rate)



The variability of meteorological parameters that affect dispersion patterns in the Miami area is also addressed by the long-term record of emissions and ambient concentrations. A five year period is long enough to experience restrictive meteorological conditions. The enforceable emissions limits, the clean air quality record presented in Chapter 3, as well as the implemented process limits show that these measures are protective of ambient air quality in the Miami area over the long term, including the restrictive meteorological conditions that would necessarily occur during the five year period.

5.2 Smelter Configuration

Smelter configuration and in particular the height of SO_2 releases, was a consideration in finding the Miami 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 Miami smelter were based on December 1975 through November 1976 records of SO_2 emissions and ambient concentrations. The smelter achieved compliance with the MPR emission limits in 1987 and remains in compliance to this date.

Stack emissions at this smelter are released from a relatively low level and comparatively near the fugitive release height. The original MPR analysis did not distinguish between stack and fugitive impacts. Although the smelter underwent significant modifications and emission reductions over the years, the location and heights of stack and fugitive SO_2 releases have changed only slightly. **Table 5.4** shows the release heights for 1976 compared to the most recent years of operation, 1999 through 2000. In addition, distances of the individual emission points to the facility property boundary have changed little since 1976.

Thus the ambient SO_2 monitoring network established in the 1970's and refined in the 1980's, including extensive sampling and testing for maximum SO_2 impact sites, occurred at a time with quite consistent emissions 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 the combined stack and fugitive SO_2 emissions from the Miami smelter.

Conclusion:

As demonstrated above, SO_2 concentrations in the Miami nonattainment area have been demonstrated to attain the NAAQS.

Table 5.4 - Miami Smelter Configuration 1976 to Present

Emissions Source	1976 Height (ft)	Present Height (ft)	Process Emission Source (1976)	Process Emission Source(Present)
Emissions Level				
Acid Plant Tail Gas Stack	200	200	Electric furnace, Converters	Electric furnace, IsaSmelt® furnace, Converters
Vent Fume Stack	234	234	Electric furnace matte tapping hoods	Electric furnace matte and slag tapping hoods, IsaSmelt® furnace tapping launders
Bypass Stack	200	200	Electric furnace, converters	Electric furnace, IsaSmelt® furnace, Converters
Dryer Stack	176	N/A	Concentrate dryer gases	Decommissioned in 1992
Fugitives	150	150	Converter and furnace gases not captured by hood and duct systems	Converter and furnace gases not captured by hood and duct systems

6.0 CONTROL MEASURES

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

6.1 Background [42]

Smelting operations at Miami began in 1915. Prior to 1974 the facility operated reverberatory furnaces and Peirce Smith converters to process copper sulfide ore from nearby mines. In 1974, an electric furnace and Hoboken or siphon converters were installed for processing dried copper ore concentrates. A double contact acid plant was also installed to clean SO_2 gases produced during the smelting and converting operations. Today the Miami primary copper smelter uses a combination IsaSmelt® Vessel and electric furnace process and has a processing capacity of more than 800,000 tons per year.

Copper is mined from a variety of ores, typically in the form of mineral compounds with sulfur. 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 the ore. At the Miami smelter, copper concentrate is delivered to the bedding plant where it is put into beds (piles) containing about 6,000 tons which are then reclaimed and conveyed to the smelter. The concentrate, comprising approximately equal parts of copper, iron, and sulfur, is transferred to the IsaSmelt® design smelting furnace. Smelting of the copper concentrate is a process designed, through the use of heat, to separate copper from the iron, sulfur, and other impurities in the copper sulfide concentrates. Concentrates and fluxes (charge materials) are fed, along with injections of oxygen enriched air and natural gas fuel, into the closed IsaSmelt® vessel where the materials are melted. The required heat comes from burning of the fuel and the partial oxidation of the sulfide and iron portion of the charge. A fraction of the sulfur is eliminated at this stage as sulfur dioxide (SO_2). The high strength SO_2 gas stream from the IsaSmelt® furnace is routed through a waste heat boiler and to an electrostatic precipitator for dust removal prior to additional cleaning and conversion to sulfuric acid in the acid plant. The tail gas from the acid plant is exhausted to the atmosphere via the tail gas stack.

All molten material is tapped at the bottom of the IsaSmelt® vessel and conveyed via a laundering system to an electric furnace where slag and matte separation occurs. The electric furnace is primarily a slag separation device. Material from the IsaSmelt® furnace and slag from the converters containing small amounts of copper, along with flux, are fed into the furnace. Much of the iron and some of the impurities in the charge oxidize with the fluxes to form a slag on top of molten matte. The iron slag can be skimmed from the top of the copper matte for disposal. Process gases from the electric furnace are cooled with water sprays and dust is removed from the gas stream

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[42] 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. Phelps-Dodge Smelter Federal Operating Permit Application, submitted November 1, 1994.
c. Phelps-Dodge Smelter 1998 Emissions Inventory Survey.

by settling. The gas stream is then routed to the acid plant for further cleaning and SO_2 removal before being discharged through the tail gas stack.

Molten copper matte from the electric furnace, containing about 60 percent copper, is tapped through covered launders into ladles and transferred by overhead cranes to one or more of three operating hot converters. Converting produces blister copper by eliminating the remaining iron and sulfur present in the matte. During this process, air is blown through the molten matte to promote further oxidation of sulphur and slagging of iron and other metals. Blowing and slag skimming continue until the copper reaches a purity of 99 percent. The molten blister copper from the converters is further fire refined in the anode vessel for the removal of oxygen and cast into anodes in the casting department for transport to an electrolytic refinery. Converter primary process gases are cooled in an air-to-gas cooler and are then combined with off gases from the IsaSmelt® and electric furnace before being routed to the acid plant. All exhaust gas from the acid plant is further controlled by a chemical peaking scrubber, if required, to maintain the 650 ppm SO_2 exhaust standard before being vented to the atmosphere via the tail gas stack.

Fugitive emissions from the IsaSmelt® launder hoods, and the electric furnace matte and slag tapping hoods are collected by the vent fume system. These gases pass through a chemical scrubber to control emissions and are discharged into the atmosphere via the vent fume stack. Process flow diagrams are included in this submittal in Appendix C.

Prior to 1975, all smelting operations process gasses were emitted into the atmosphere after particulate removal by an electrostatic precipitator. From sulfur balance data the average emissions were reported to be at least 34,000 lbs/hr. The installation of an acid plant in late 1974 added SO_2 control for the electric furnace and primary converter gas.

As smelting and emission control technology improved, the smelter operators initiated changes to further reduce emissions and increase production. A series of improvements in 1992 included installation of an IsaSmelt® furnace and a 528 ton per day oxygen plant to enrich the smelting process gases. The installation of the new IsaSmelt® furnace eliminated the use of the electric furnace as the primary device for smelting. The improvements also included an upgrade of the double-contact acid plant, which has a current process rating of 140,000 scfm and 2,400 tons of acid each day.

The double-absorption sulphuric acid plant is the predominant control device for primary process SO_2 gases at this smelter. Process gases produced by the IsaSmelt® furnace, electric furnace, and converters are cleaned of particulates in a gas scrubbing system to prepare the gas stream for treatment in the acid plant. The Miami smelting process provides a steady gas feed to the acid plant, enabling optimal plant performance.

In the acid plant, the SO_2 is cleaned, dried, and converted by catalyst to sulphur trioxide (SO_3). The SO_3 is readily adsorbed in circulating sulphuric acid to become salable grade acid. 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 efficiency of SO_2 recovery by the acid plant is 99.9%. Based on measurement data from the continuous emission monitor in the tail gas stack, the average acid plant tail gas emission SO_2 concentration was 298 ppm during an April 21, 1998, compliance test run. Additional control for the acid plant exhaust gases is provided by the acid plant tail gas peaking scrubber. The annual average process rate for this smelter is estimated at 97 dry tons per hour (tph) of new sulfide concentrates. 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 IsaSmelt® vessel, electric furnace, and converters.

To improve the removal efficiency of the acid plant and decrease tail stack emissions, the facility has replaced and upgraded its deteriorated catalytic converter and absorbing towers to withstand the stronger gas strengths being produced as a result of the new smelting furnace (up to 10.5% SO_2 gas strength). In addition to the tower replacement, a new acid pump tank, heat exchangers, and associated pumps were installed. The new towers are equipped with new high efficiency (candle type) mist eliminators, which resulted in improved performance of the Acid Plant.

The 1991 IsaSmelt® conversion improved the control of SO_2 emissions and helped minimize the release of fugitive emissions directly to the atmosphere. The new furnace's closed vessel design fully contains emissions so they can be more effectively routed to the acid plant.

Release of fugitive emissions can also occur during the transfer of matte and converter return slag across the converter aisle. Due to a higher matte grade (58%) produced from the IsaSmelt® operations, the total amount of sulfur in these materials is reduced. The higher matte grade also reduces the amount of converter blowing time. During a slag blow, the converter must be rolled out and skimmed, which can contribute to the escape of emissions from the converter mouth. Consequently, the lower sulfur content of the matte results in an overall reduction of converter aisle fugitive emissions.

Additional improvements included the addition of fugitive emission collection equipment at tapping areas of the smelter. In 1981, hooding was installed over the electric furnace matte tapping area. In 1992, new hoods and ducting were installed above the slag tapping area on the electric furnace and above the IsaSmelt® tapping area. At this time, the ventilation fans were upgraded to increase the flow rate through the vent fume system and a scrubber was added to treat the captured ventilation gases from all electric furnace and IsaSmelt® tapping areas.

Although furnace secondary process emissions are hooded to minimize the release of emissions directly to the atmosphere, fugitive emission control is also dependent upon maintenance and operating procedures. Adequate control of fugitive emissions from the converting process at the Miami smelter is achieved by regular maintenance of the converting equipment. The facility presently utilizes four Hoboken siphon type converters with air-to-gas heat exchangers.[43] The siphon converter is fitted with a flue at one end to siphon gases from the converter directly to an off gas collection system and was designed to maximize the removal of gas and maintain a high percentage of SO_2 for treatment in the acid plant. Under normal operating conditions, an equilibrium of air flow or draft is maintained at the converter mouth. The draft is continuously adjusted to prevent excessive air flow into the converter and cooling of converter contents. Control of excessive flow out of the converter mouth prevents escape of fugitive SO_2 emissions. Equilibrium draft is maintained by the use of a valve, which is used to regulate the flow through the converter. This equipment is a 48 inch diameter butterfly valve.

Periodic buildup of accumulated solid materials located at the discharge end of the converter or the damwall area can occur over time. This is due to the cooling of molten particles produced during the converting process. If not removed periodically, the buildup will eventually restrict the flow of converter gas to the acid plant, and disrupt the airflow at the mouth of the converter, resulting in fugitive emissions.

To determine when a converter should be shut down for damwall cleaning the facility monitors the butterfly valve that adjusts the flow of gases through the converter. When the converter

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[43] A fifth converter is currently not operational.

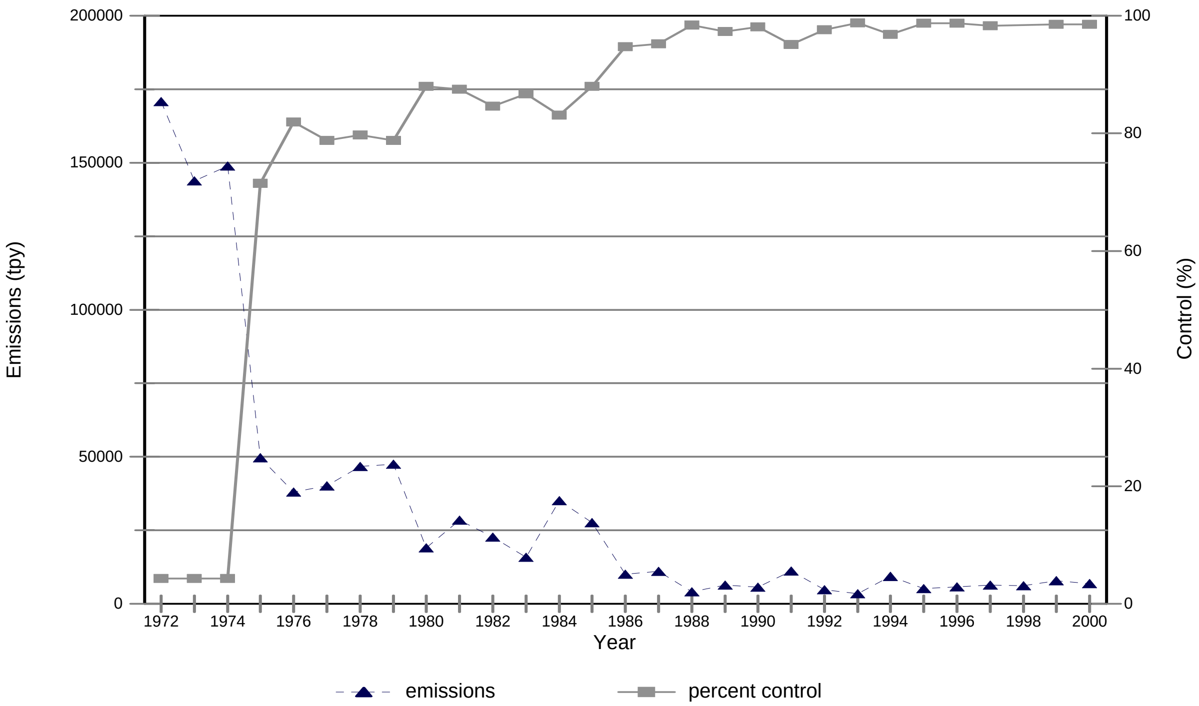
damwall area is clean, the butterfly valve is normally partially open. As solid material builds up on the damwall over time, the valve is opened further to compensate for the restricted air flow within the converter. Eventually, the valve must be opened to the maximum level (100%) to maintain the equilibrium of airflow at the mouth of the converter. Subsequently, the converter is shutdown to do the necessary cleaning and maintenance work. Phelps Dodge continues to monitoring the operation of the butterfly valve to ensure optimal performance of the draft valve and flow of converter gas to the acid plant.

The process changes and emissions control improvements implemented at the Phelps-Dodge smelter are summarized in Table 6.1 below. Figure 6.1 on the following page illustrates the pre-control and post-control SO_2 emissions levels.

Table 6.1 - Implementation of SO_2 Process and Control Technology

Year	Equipment
1974	Replacement of reverberatory furnace and old converters with an Electric Furnace and Hoboken converters. Installation of a double contact acid plant for treatment of primary process gases.
1979-1981	Installation of Electric Furnace matte fume hoods at matte tapping area for capture of fugitive emissions.
1992	Installation of an IsaSmelt® Furnace and new oxygen plant. Installation of IsaSmelt® Furnace tapping launder covers, Electric Furnace slag tapping hoods, and vent fume scrubber for capture and control of fugitive emissions. Upgrade to increase the fan capacity of vent fume system for the two new fugitive emissions collection points. Upgrades to the acid plant and installation of a 3rd stage electrostatic mist precipitator at the acid plant and acid plant tail gas peaking scrubber for control of primary process emissions.
1997	Replacement of the old intermediate absorption tower at the acid plant with a new tower to increase the efficiency of the acid plant. The replacement is equipped with high efficiency (candle type) mist eliminators. Installation of a new catalytic converter, preheater, SO_3 cooler, product acid cooler, and a final absorber, and replacement of two cold reheat exchangers at the acid plant.
1998	Intermediate absorber and cold reheat exchangers put into service.

Figure 6.1 - Miami Smelter SO_2 Emissions and Percent Control **(corrected 5/26/04)**



6.2 Emissions Limitations for Phelps-Dodge

<u>6.2.1 AAC Rule R18-2-715(F), R18-2-715(H) and 18-2-715.01 - 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 Phelps-Dodge copper smelter at Miami:

1. Annual average stack emissions, as calculated pursuant to AAC R18-2-715.01(C) through (J) shall not exceed 3,163 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)(4).

ADEQ's 2002 rule revision incorporated the following stack limits and added facility-wide limits for the Phelps-Dodge 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 604 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)(3).
2. Annual average total emissions, as calculated under AAC R18-2-715.01(U), shall not exceed 2420 lbs/hr.

Estimated SO_2 Emission Reduction:

Emissions were reduced by over 150,000 tpy from 1972 levels following compliance with the 1979 rule. Subsequent implementation of additional emissions collection and control measures enabled the 2002 revision that provides a further reduction in allowable emissions of 11,208 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 $80,000 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:

Phelps-Dodge submitted a proposed compliance schedule for achievement of the 1979 MPR stack emission limits as expeditiously as practicable. A permit issued in 1984, included a compliance plan for installation of additional fugitive emission control equipment. All installations were completed the same year. The smelter subsequently submitted a permit application in 1990 for a $100 million project to install the IsaSmelt® vessel, an oxygen plant, and additional emissions collection and control equipment. All on-site construction and installation of emission control equipment and process modification was completed in 1992. The collection and control technology implemented by Phelps-Dodge has allowed the facility, which had already demonstrated attainment, 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, Phelps-Dodge 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 5 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). Phelps-Dodge installed and operates CEMS at the outlets of the vent fume stack, acid plant tail gas stack, and prior to the acid plant bypass. In addition to primary process gas, captured fugitive emissions 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). Monitoring and emissions data submitted by Phelps-Dodge indicated that the smelter was in compliance with the 1979 emission limits by 1988.

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 Phelps-Dodge smelter stack 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 Phelps-Dodge are reported to ADEQ. To ensure continued compliance, Phelps-Dodge 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), Phelps-Dodge measures at least 95 percent of the hours during which emissions occurred in any month and has not failed to measure any 12 consecutive hours of emissions. Phelps-Dodge 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 averages 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 R18-2-715.01(F) for the compliance periods ending on each day of the month being reported;
4. The date on which a cumulative occurrence limit listed in R18-715.01(F) 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, Phelps-Dodge performs a monthly material balance for sulfur and includes the results in the monthly compliance reports to ADEQ. Based on these reports, the smelter continues to document a sulfur recovery rate over 98 percent. The average monthly sulfur recovery rate for 1999, through 2000, was calculated to be 98.5 percent.

In addition to monthly compliance reports, ADEQ also receives from Phelps-Dodge quarterly audit, excess emissions, and CEM downtime 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 and monitored to detect and record all periods that the bypass is in operation. The bypass has been used during periods when the plant is shut down for repairs or in emergencies. All production activities at the smelter cease during a bypass. Phelps-Dodge 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 bypass.

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 Miami 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 732 tpy was estimated following 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 Phelps-Dodge. 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 Phelps-Dodge smelter are primarily generated from the furnace, converter, and anode process areas. Emissions that escape the collection systems exit the

buildings through roof vents and other openings. These alternate exit points were identified by Phelps-Dodge through flow visualization tests and survey sampling. A fugitive emissions study was conducted to provide a measurement or accurate estimate of the relative percentage of fugitive emissions during typical operations. A final report was submitted to ADEQ on August 27, 1991. The 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. Approximately 35 percent of the total sulfur dioxide emissions from this facility were attributed to converter building fugitives. A Summary of the fugitive emission study is 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 Miami area (See **Section 6.2** for a description of implemented equipment). Rule provisions for the smelter include facility-wide limits. Captured fugitive emissions which are scrubbed to remove SO_2 are included when determining compliance with the limits described in Section 6.3.1.

6.2.3 Phelps-Dodge 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 Phelps-Dodge 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. Additionally, Phelps-Dodge submitted a standard Title V permit application form to ADEQ in October 1994. The application for the Phelps-Dodge smelter including the IsaSmelt® furnace, electric furnace, Hoboken converters, anode furnaces, double absorption acid plant, oxygen plant, and associated equipment is currently under review.

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

Table 6.2 - Permit Conditions		
Date	**Permit Number**	**Controls**[45]
August 1, 1984	0310-84	Included emission limit of 85 tpd for sulfur which equates to an SO_2 emission limit of 62,050 tpy.
May 30, 1991	1232	Retrofit to install IsaSmelt® furnace, new oxygen plant, vent fume and acid plant tail gas scrubber, IsaSmelt® furnace tapping launder covers, electric furnace slag tapping hoods, and upgrade of acid plant. The permit also established a facility-wide annual average SO_2 limit of 2,420 pounds per hour.
Title V application	1000046	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 Phelps Dodge Miami ambient SO_2 monitors are also required.

[45] All listed controls have been captured in the facility's Title V permit.

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 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:

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

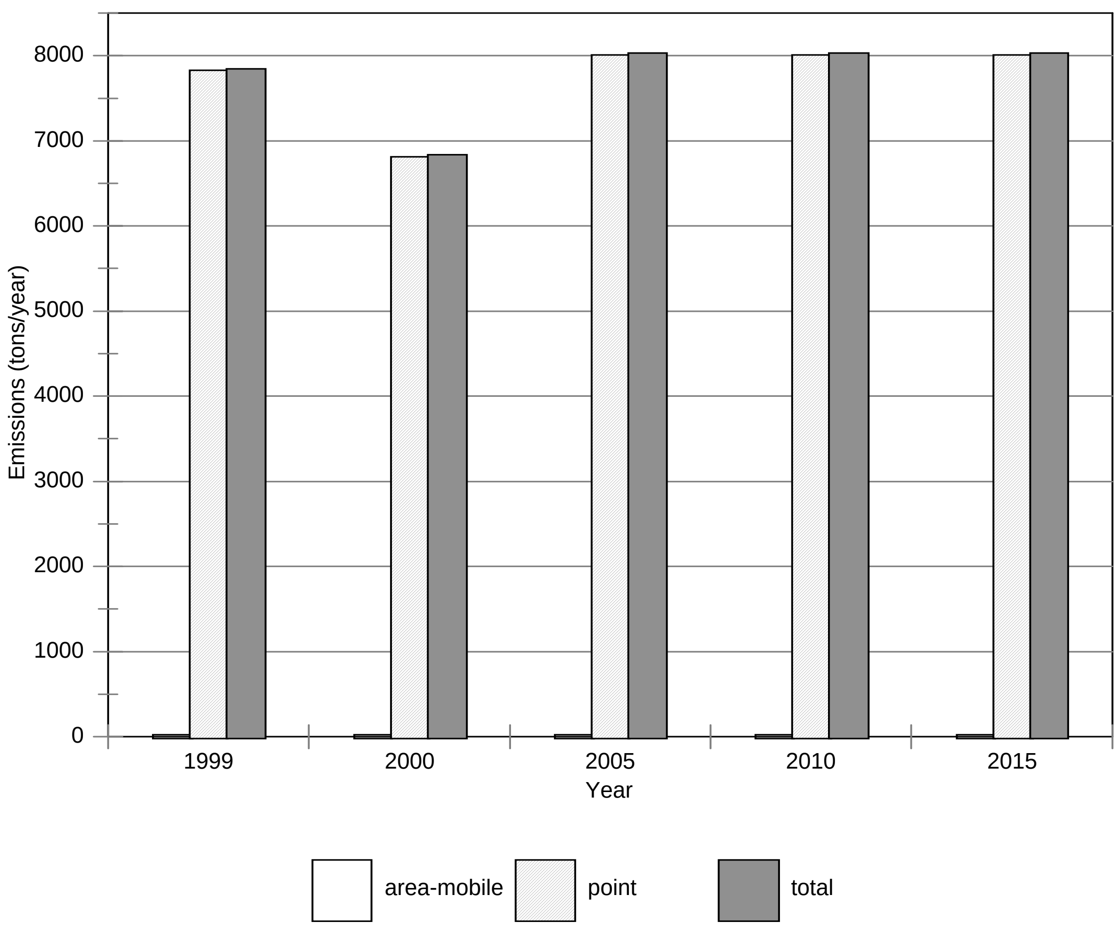
This submittal demonstrates that all of the above required elements have been met. ADEQ also commits to a SIP revision subsequent to this submittal providing for maintenance of the NAAQS for an additional ten years. This subsequent revision is due eight years into the first ten year maintenance period.

7.1 Maintenance Demonstration

Copper smelting operations at the Phelps-Dodge facility are the single greatest source of SO_2 emissions in the Miami 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 the most recent eight quarters of smelter operations showing attainment of the SO_2 NAAQS (See **Chapter 4**). Once the area is redesignated, any new source 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 Phelps-Dodge 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 grow only slightly through 2015. The estimate of mobile and area source emissions through the maintenance period is based on 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 15 percent increase of total emissions from all source categories through 2015 from 2000 base year levels. However, the projected 2015 emissions are less than 3 percent higher than 1999 nonattainment area emissions levels. Because the attainment emissions inventories demonstrate a stringent level of protection of ambient air quality and only slight growth from 2000 base year inventories is estimated for total source emissions, once redesignated, the area is projected to continue to exhibit a substantial margin of safety protective of the SO_2 NAAQS.

Figure 7.1 - Miami 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 Phelps-Dodge, commit to continue monitoring ambient SO_2 concentrations for at least 10 years following the approval of this SIP and maintenance plan. Phelps-Dodge will continue to calibrate, maintain and operate the SO_2 monitors at the Jones Ranch and Townsite sites. The ambient SO_2 monitoring equipment operated by Phelps-Dodge 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 Ridgeline 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 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, Phelps-Dodge will continue to monitor ambient temperature, wind speed, and direction for at least 10 years following the approval of this SIP and maintenance plan at the Jones Ranch and Townsite 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 any changes to 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.[46]

Permitted sources are subject to the monitoring and reporting, and certification procedures contained in AAC R18-2-306 and AAC R18-2-309 respectively. Phelps-Dodge 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

[46] See **Appendix A** for the ADEQ Organizational Chart.

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 **Appendix A**). Because the Phelps-Dodge Miami 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.[47]

A first occurrence in a calender year of a verified ambient 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

Phelps-Dodge 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 Phelps-Dodge operated SO_2 monitors, the facility 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 Phelps-Dodge 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.

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

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 IsaSmelt® and electric furnace process and fugitive gases and the converter process,
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.

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, Phelps-Dodge 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.[48] 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 monthly to weekly for the 12 month period following an exceedance of the PTL.[49] 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, Phelps-Dodge 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 Phelps-Dodge is necessary.

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

[48] 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.

[49] Current maintenance procedures are described in Phelps-Dodge's Title V permit.

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.

Phelps-Dodge'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 Phelps-Dodge'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 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 Phelps-Dodge 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).

Phelps-Dodge 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. As detailed above, and in Chapter 5, compliance with the $SO2_2$ NAAQS will be maintained during the next ten years.

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