FINAL

PM_{10} STATE IMPLEMENTATION PLAN FOR THE HAYDEN GROUP I AREA

PREPARED BY

OFFICE OF AIR QUALITY
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
2005 NORTH CENTRAL, PHOENIX, ARIZONA 85004

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TABLE OF CONTENTS

	Table of Contents	i
	Tables	iv
	Figures	vi
	Appendices	vii
	Acronyms	viii
	Executive Summary	1
1.0	**Introduction**	**13**
1.1	Purpose	13
1.2	Background	13
1.3	Study Area Definition	14
1.3.1	Climate	18
1.3.3	Population	18
1.3.4	Economic Status	18
1.4	General SIP Approach	19
1.5	Plan Contents	19
2.0	**Data Base Development**	**21**
2.1	Air Quality	21
2.1.1	Existing Air Quality Data	21
2.1.2	Special PM10 Monitoring for SIP	23
2.2	Receptor Modeling Data Base	23
2.2.1	Receptor Model Selection	23
2.2.2	Ambient Profile Development	24
2.2.3	Source Profile Development	28
2.3	Dispersion Modeling Data Base	31
2.3.1	Model Selection	31
2.3.2	Emission Inventory	31
2.3.3	Meteorological Data	33
3.0	**CMB Results and Model Validation**	**35**
3.1	Analytical and CMB Results	35
3.1.1	Measured Particulate Mass Concentrations	35
3.1.2	Ambient Particulate Chemistry	36
3.1.3	Elemental Composition of Source Profiles	40
3.1.4	Source Impacts	40
3.2	CMB Model Validation	44
3.2.1	Quality of CMB Results	44
3.2.2	Meteorological and Site Dependence of Source Contributions	45
3.2.3	Particle Size Dependence	46
3.2.4	Source Variability	46
3.2.5	Major Source Impacts	47
3.2.6	Large Chi Square Values and Unexplained Mass	49

4.0	**Reconciliation of Receptor/Dispersion Model Results**	**51**
4.1	Preliminary Dispersion Modeling	51
4.2	Model Reconciliation	51
4.3	Summary of Model Reconciliation Analysis	59
5.0	**Base Year Dispersion Modeling .....**	**65**
5.1	24-hour Design Concentration	67
5.2	Annual Arithmetic Mean Design Concentration	67
6.0	**Control Strategy Alternatives - PM10 .....**	**68**
6.1	Emission Reductions Needed to Attain NAAQS	68
6.1.1	24-hour Maxima	69
6.1.2	Annual Arithmetic Mean	69
6.2	Growth Projections and Banked Emissions	69
6.3	Emission Reductions Needed for 1990 NAAQS Compliance	73
6.3.1	Needed Reductions for 1990 NAAQS Attainment	73
7.0	**Source Specific Control Options and Implementation .**	**76**
7.1	Copper Ore Unloading, Crushing, and Conveying	76
7.1.1	Description of Source Category and Current Controls	76
7.1.2	Proposed Control Strategy	81
7.1.2.1	Controls on Stack Sources	82
7.1.2.2	Controls on Fugitive Dust Source.....	82
7.1.3	Demonstration of Effectiveness	85
7.1.3.1	Stack Emissions	85
7.1.3.2	Fugitive Emissions	85
7.1.4	Means of Implementation	86
7.1.4.1	Stack Sources	91
7.1.4.2	Fugitive Dust Sources	91
7.2	Unpaved Roads	91
7.2.1	Description of Source Category	91
7.2.2	Proposed Control Strategy	92
7.2.3	Demonstration of Effectiveness	95
7.2.4	Means of Implementation	95
7.3	Paved Roads	95
7.3.1	Description of Source Category	95
7.3.2	Proposed Control Strategy	95
7.3.3	Means of Implementation	95
7.4	Locomotives	96
7.4.1	Description of Source Category	96
7.4.2	Proposed Control Strategy	96
7.4.3	Demonstration of Effectiveness	96
7.4.4	Means of Implementation	96
7.5	Gypsum Plant	96
7.5.1	Description of Source Category	96
7.5.2	Proposed Control Strategy	98
7.5.3	Demonstration of Effectiveness	98
7.5.4	Means of Implementation	98

7.6 All Others 98
7.6.1 Description of Source Category 98
7.6.2 Proposed Control Strategy 98
7.6.3 Demonstration of Effectiveness 98
7.6.4 Means of Implementation 99
7.7 Mineral Tailings 100
7.7.1 Description of Source Category 100
7.7.2 Proposed Control Strategy 100
7.7.2.1 Active Roads at the Tailings Dam 100
7.7.2.2 Tailings Ponds 102
7.7.3 Demonstration of Effectiveness 102
7.7.4 Means of Implementation 102

8.0 Summary 102

9.0 Related Issues 107

9.1 Ambient Monitoring 107

10.0 Preconstruction Review 107

11.0 Demonstration of NAAQS Maintenance through 1997 107

11.1 Contingency Plan 107

12.0 Reasonable Further Progress Report 108

13.0 References 110

TABLES

Exec. Summary

Table 1 Final Modeling Results - Hayden 4
Table 2 Summary of 1986 PM10 Emissions Inventory-Hayden 5
Table 3 1986 24-hour Source Category Contributions 6
Table 4 1986 Annual Source Category Contributions 7
Table 5 1990 24-hour Demonstration Attainment 8
Table 6 1990 Annual Demonstration Attainment 9
Table 7 1997 Demonstration Attainment 10

Table 2.1 Measured Air Quality - Hayden Jail Site 22
Table 2.2 Summary - Analysis and Source Apportionment ... 25
(2 pgs.) 26
Table 2.3 Days Included in Meteorological Regimes & Regime Characteristics 27
Table 2.4 Summary of Sampling Data - for Process Emissions Collected at the ASARCO Hayden Copper Smelter . 29
Table 2.5 Summary of ASARCO - Hayden Resuspension Data .. 30
Table 2.6 Summary of 1986 PM10 Emissions Inventory - Hayden 32

Table 3.1 Comparison of Mean Suspended Particulate Mass at Hayden Sampling Sites 37
Table 3.2 Average Fine Particle Elemental Composition ... 38
Table 3.3 Average Coarse Particle Elemental Composition ... 39
Table 3.4 Sample Source Apportionment Results-Hayden Coarse Fraction, January 4, 198[illegible] 41

Table 4.1 Preliminary Modeling Results - Hayden PM10 Modeling - Model Reconciliation 54
Table 4.2 Final Modeling Results - Hayden PM10 Modeling - Model Reconciliation, ALL DAYS ....
Table 4.3 Final Modeling Results - Hayden PM10 Modeling Model Reconciliation, REGIME 1 1
Table 4.4 Final Modeling Results - Hayden PM10 Modeling - Model Reconciliation, REGIME 2 62
Table 4.5 Final Modeling Results - Hayden PM10 Modeling - Model Reconciliation, REGIME 3 63

Table 5.1 Tabular Estimation of PM10 Design Concentrations 66

Table 6.1 Source Category Contributions (µg/m3) to 1986 Base Year 24-hour PM10 Design Value 70
Table 6.2 Source Category Contributions (µg/m3) to 1986 PM10 AAM Design Value 71
Table 6.3 Source Category Contributions (µg/m3) to 1990 24-hour Maximum PM10 Concentrations 74
Table 6.4 Source Category Contributions (µg/m3) to 1990 PM10 Concentrations 75

Table 7.1 1990 Source Category Contribution and Control Strategy for 24-hour Maximum PM10 NAAQS Demonstration 77
Table 7.2 1990 Source Category Contribution and Control Strategy for AAM PM10 NAAQS Demonstration 78
Table 7.3 Attribution of Fugitive Emissions Among Ray Unit Crushing Building 84
Table 7.4 Ray Unit Crushing Building Fugitive 87
Emission Sources and Controls (2 pgs.) 88
Table 7.5 Ray Unit Crushing Plant Transfer House Fugitive Emission Sources and Controls 89
Table 7.6 Net Decrease in Fugitive Emissions Impact of Ray Unit Crushing Plant 90

Table 8.1 Demonstration of Attainment of 24-hour NAAQS .. 103
Table 8.2 Demonstration of Attainment of Annual NAAQS ... 104
Table 8.3A ASARCO Ray Unit - Dust Collector Installation Plan 105
Table 8.3B ASARCO Ray Unit - Dust Control Action Plan 106

Table 11.1 Demonstration of Attainment of 24-hour NAAQS .. 109

FIGURES

Exec. Summary

Figure 1 Projected 24-hour Concentration - Hayden 11

Figure 2 Projected Annual Arithmetic Mean Concentration - Hayden 12

Figure 1.1 15

Figure 1.2 16

Figure 1.3 17

Figure 2.1 Hayden Point Sources Used in Dispersion Model . 34

Figure 4.1 Flow Diagram for Model Reconciliation 52

Figure 4.2 Comparison of CMB and Final ISC Model Predictions of PM10 Concentrations 64

Figure 7.1 Crushing Plan 79

Figure 7.2 ASARCO Ray Unit - Location Map 80

Figure 7.3 ASARCO Ray Unit - Unpaved Roads 93

Figure 7.4 Ore Bedding Areas - To be Paved 94

Figure 7.5 ASARCO Ray Unit - Gypsum Loading Station 97

Figure 7.6 ASARCO Ray Unit - Roads, Capped/Uncapped 101

APPENDICES

Appendix A	Source Apportionment of Suspended Particles and Toxic Elements in Hayden, Arizona
Appendix B	Chemical Mass Balance Source Impact Results and Elemental Composition from EPA CMB Receptor Model Version 5.9
Appendix C	Elemental Composition Source Profiles
Appendix D	Average Source Contribution Tables
Appendix E	Hayden Point and Area Source Emissions Inventory Results and Documentation
Appendix F	Public Hearing - Public Comments and Responsiveness Summary
Appendix G	Copies of Written Comments
Appendix H	ASARCO's Operating and Installation Permits
Appendix I	Related Arizona Administrative Code
Appendix J	Locomotive Rule
Appendix K	ASARCO Glover Lead SIP
Appendix L	ASARCO's Letter Regarding Prevention of Off-Road Vehicle Activities

ACRONYMS

ADEQ	Arizona Department of Environmental Quality
Al	Aluminum
As	Arsenic
A.A.C.	Arizona Administrative Code
Ca	Calcium
Cd	Cadmium
CFR	Code of Federal Regulations
Cl	Chlorine
CMB	Chemical Mass Balance
Cr	Chromium
EPA	Environmental Protection Agency
ES	Engineering Science
F	Fahrenheit
Fe	Iron
ISCST	Industrial Source Complex Short Term (Model)
K	Potassium
Mn	Manganese
NAAQS	National Ambient Air Quality Standard
Ni	Nickle
Pb	Lead
PM10	Particulate Matter of 10 microns or less in diameter
PSD	Prevention of Significant Deterioration
Sb	Antimony
SCE	Source Contribution Estimate
Si	Silica
SIP	State Implementation Plan
SSI	Size Selective Inlet
Ti	Titanium
TSP	Total Suspended Particulates
XRF	X-Ray Fluorescence
Zn	Zinc
µg/m3	micrograms per cubic meter

EXECUTIVE SUMMARY

In accordance with the mandates of sections 108 and 109 of the Clean Air Act, the Environmental Protection Agency (EPA) promulgated revised National Ambient Air Quality Standards (NAAQS) for particulate matter in July 1987. The new standards apply to particulates of 10 micrometers or less in diameter (PM_{10}) and supersede the previous Total Suspended Particulates (TSP) standards.

Section 110 of the Clean Air Act requires states to develop or revise their State Implementation Plan (SIP) to provide for implementation, maintenance, and enforcement of the new PM_{10} NAAQS. This document is prepared to satisfy this requirement for the vicinity of Hayden, Arizona, where violations of these standards have been measured. The PM_{10} planning area for Hayden remains consistent with the TSP nonattainment area designation of T5S,R15E. (See 40CFR 81.303.) This document describes the steps taken to evaluate the PM_{10} pollution in the Hayden area, and lists the necessary control strategies and the implementation procedure for each control strategy.

The Hayden area contains two copper smelters, one of which is currently inactive, and a large tailings pile associated with the ore concentrator. Also associated with smelter operations are copper ore unloading, crushing and conveying facilities. Streets and roads in the Hayden area are generally paved, with the exception of two moderately traveled roads within the town of Hayden.

The Arizona Department of Environmental Quality (ADEQ) has operated a PM_{10} monitoring device at the Hayden Jail site since the beginning of 1985. Previously, ADEQ had operated a TSP monitor at that site. To collect data for receptor modeling, ADEQ operated additional monitoring equipment at both the Hayden Jail and Garfield sites from late November, 1986 through January, 1987. Monitoring data indicated exceedances of both the annual arithmetic mean PM_{10} standard concentration of 50 $\mu g/m^3$, and the 24-hour maximum PM_{10} standard concentration of 150 $\mu g/m^3$. The maximum 24-hour PM_{10} concentrations measured were 243 $\mu g/m^3$ and 236 $\mu g/m^3$ at the Hayden Jail and Garfield sites, respectively. The maximum annual arithmetic mean concentration measured at the Hayden Jail monitor was 80 $\mu g/m^3$ (For more information refer to Table 2.1).

To develop the <u>Demonstration PM10 SIP for Hayden</u>, EPA hired Engineering Science (ES) and NEA Inc. to conduct the necessary emission inventory and modeling. The final document was prepared in 1987. This SIP relies on their air quality assessment, however, necessary modifications are made to clarify some of the final results and adopted control strategies.

For the receptor modeling data base, X-Ray Fluorescence (XRF) analyses of filters from both monitoring locations and of source samples collected from suspected major contributors provided most of the information needed. From these analyses and source characterization data from the literature (EPA-450/4-85-002), Chemical Mass Balance (CMB) calculations were performed for selected days of the approximate two month sampling period, December 1986 through January 1987. The CMB analysis provided an adequate characterization of the different types of PM_{10} sources in the Hayden area.

A gridded emissions inventory for the Hayden area plus local meteorological data provided the data base for the use of EPA approved Industrial Source Complex (ISC) dispersion modeling.

The PM_{10} SIP Development Guideline (EPA, 1986) recommends that both receptor and dispersion models be used to improve the accuracy of apportioning air pollution impacts to specific sources. These two modeling techniques use different inputs and calculation techniques, and generally produce different results. The Protocol for Reconciling Differences Among Receptor and Dispersion Models (EPA, 1986) was used to reconcile these differences. The results of the model reconciliation analysis are summarized in Table 1. This procedure ensured that the major contributors to the ambient PM_{10} concentrations in the Hayden area were sufficiently identified.

The 1986 emissions inventory, adjusted through model reconciliation, together with one full year of meteorological data were used as input to dispersion modeling to estimate the 1986 base year concentrations both for the annual arithmetic mean and the 24-hour maximums. The 1986 PM_{10} emissions inventory used to determine the "design" concentrations is given in Table 2. Based on criteria in the PM_{10} SIP Development Guideline and the Guideline on Air Quality Models (Revised) design concentrations of 618 $\mu g/m^3$ (24-hour) and 103 $\mu g/m^3$ (annual average) were determined, and provided the basis for control strategy development. The model results identified the major PM_{10} contributors and their relative air quality impacts. (See Tables 3 & 4.) Control options were compiled and evaluated for each of the major sources, and selected options formulated into control strategies. ~~The impacts of possible operation of the second smelter at Hayden (not operated since 1980) and an estimated 10 percent increase in activity levels of population dependent sources, were evaluated, as were the effects of the selected control strategies for the year 1990. (See Tables 5 & 6.) The estimated potential emissions from the Ray smelter were used in the assessment of 1990 ambient PM10 concentrations in order to address the effect of the possible start-up of the smelter. Additional growth between 1990 and 1997 is expected to occur, and, therefore, the 1997 emissions were increased accordingly. (See Table 7.)~~ While there has not been any population growth in Hayden and both ASARCO plants remain at the same level of production as in 1986, a 10 percent growth was presumed for the three categories of unpaved roads, paved roads, and "all others"

to calculate the 1990 projected emissions. (See Tables 5 & 6). The impact of the possible operation of the second smelter at Hayden (not operated since June 1982) is reflected in the calculation of 1997 emissions. Even though the population projection for the city of Hayden reflects no growth until the year 2000, we have incorporated a 10 percent growth for the four categories of unpaved roads, paved roads, locomotives, and "all others" (See Table 7). This growth rate reflects the likely increase in activities due to the possible start-up of the Ray smelter.

The model results showed that the application of controls to major PM_{10} source groups in the Hayden area would result in attainment of the PM_{10} NAAQS by 1990, and maintain attainment status through 1997. Emission reductions would be achieved by the following control strategies:

(1) installing new dust collectors at dump hopper, crusher building, and transfer tower;

(2) installing a spray system at dump hopper;

(3) installing new hooding and a spray system on conveyor C2, which is located at the basement of the crushing building;

(4) implementing better work practices at the crushing building (prevention of dust re-entrainment, water washdowns of the lower floors of the crusher building, and operation of a vacuum truck at the building's ground-level and basement floors;

(5) increasing the angle of the idlers on the conveyor C9 to 35°;

(6) stabilizing unpaved roads including Kennecott Road and Canyon Drive through application of dust suppressants;

(7) paving storage areas and additional house-keeping activities; and

(8) preventing off-road vehicular activities;

(9) control of locomotive exhaust emissions.

Figures (1) and (2) show the 24-hour and the annual average design values as well as projected air quality reflecting the impact of growth and implementation of the control strategies.

This plan commits the Department to implement these control strategies through operating permits for the ASARCO facilities and adoption of appropriate rules.

TABLE 1

Final Modeling Results
Hayden PM_{10} Modeling - Model Reconciliation
All Days

Source Group	24-hr Impact (ug/m^3) Garfield CMB	Garfield ISC	Jail CMB	Jail ISC
Auto Exhaust	0.23 ± 0.12	0.42 ± 0.13	0.19 ± 0.14	0.39 ± 0.12
Roadway Dust	4.69 ± 2.46	13.46 ± 4.04	20.71 ± 4.69	23.21 ± 6.96
Tailings	5.29 ± 3.60	0.01 ± 0.00	0 ± 0.00	0 ± 0.00
Smelter Building Fug.	0.86 ± 0.66	1.02 ± 0.31	1.04 ± 0.66	1.11 ± 0.33
Slag Dump	0.06 ± 0.06	1.08 ± 0.32	0.03 ± 0.03	1.43 ± 0.43
Copper Ore	73.75 ± 14.73	61.47 ± 18.44	27.72 ± 7.51	12.10 ± 3.63
Lime Handling	0.34 ± 0.30	1.06 ± 0.32	0.57 ± 0.57	1.65 ± 0.50
Gypsum	1.63 ± 0.48	1.88 ± 0.56	2.94 ± 0.71	2.39 ± 0.72
Secondary SO_4	4.11 ± 0.43	—	4.03 ± 0.58	—
Other*	13.44 ± 5.03	4.82 ± 1.45	2.29 ± 1.66	2.30 ± 0.69
Background	—	16.00	—	16.00
All Sources	104.51	101.22	59.49	60.58
Total Measured	104.51		59.49	

* ISC: Woodburning, Locomotives, Windblown Dust, Stack
CMB: Unexplained

TABLE 2

Summary of 1986 PM_{10} Emission Inventory
for Hayden, AZ

Source Category	Source Type[a]	Annual-Average Emission Rate (ton/yr)
Automobile Exhaust 11 (including brake and tire wear)	A	2.0
Roadway Dust 5	A	35.4
Woodburning Stoves 12	A	0.3
Copper Ore Tailings 2	A	84.9 2
Locomotive Exhaust 10	A	5.3
Windblown Dust 10	A	2.3
ASARCO Smelter Stack 1	P	87.5 1
ASARCO Smelter Building Fugitives 6	P	17.7
ASARCO Slag Dump 4	P	40.6
Copper Ore 7	P	15.3
Ore Crusher 3	P	59.8 3
Lime Handling 8	P	13.2
Gypsum 9	P	13.2
Total		377.5

[a] A = area source, P = point source

Table 3

Source Category Contributions (μg/m3)
to 1986 24-Hour Maximum PM10
Concentrations[1]

Source Category	Contribution to Ambient Concentrations (μg/m3)
Copper Ore, Unloading, Crushing, Conveying	410.8
Road Dust (Excluding Kennecott and Canyon Dr.)	100.5
Locomotives	58.8
Kennecott and Canyon Drive	5.3
Gypsum	10.2
All Others	16.2
Background	16.0
Total All Sources	618.0

1 The 24-hour maximum refers to the highest second high concentration in the Group I Area.

Table 4

Source Category Contributions (μg/m3)
to 1986 Annual Maximum PM10
Concentrations[1]

Source Category	Concentrations (μg/m3) Contribution to Ambient
Copper Ore, Unloading, Crushing, Conveying	61.7
Road Dust (Excluding Kennecott and Canyon Dr.)	11.0
Locomotives	5.4
Kennecott and Canyon Drive	2.1
Gypsum	1.9
All Others	4.4
Background	16.0
Total All Sources	102.5

[1]Garfield monitor measured the highest annual average.

Table 5

Demonstration of Attainment
of 24-hour NAAQS

Source		1990 (Before Controls), µg/m3		% Reduction		1990 (After Controls) µg/m3
Ore Unloading, Crushing and Conveying		410.8		90.4		39.6
o Fugitive	225.9		86.9		29.6	
o Process	184.9		94.6		10.0	
Unpaved Roads		86.5		90.0		8.7
Paved Roads		29.9		0.0		29.9
Locomotives		58.8		60.0		23.5
Gypsum		10.2		100.0		0.0
All Others		17.8		36.4		11.3
Background		16.0		0.0		16.0
Total		630.0		80.0		129.0
NAAQS						150.0

Table 6

Demonstration of Attainment of Annual NAAQS

Source			1990 (Before Controls), µg/m3	% Reduction		1990 (After Controls) µg/m3
Ore Unloading, Crushing and Conveying			61.7	90.4		5.9
o	Fugitive	33.9	86.9		4.4	
o	Process	27.8	94.6		1.5	
Unpaved Roads			11.1	90.0		1.1
Paved Roads			3.3	0.0		3.3
Locomotives			5.4	60.0		2.2
Gypsum			1.9	100.0		0.0
All Others			4.8	36.4		3.1
Background			16.0	0.0		16.0
Total			104.2	70.0		31.6
NAAQS						50.0

Table 7

Demonstration of Attainment
of PM10 Standards in 1997
After Implementation of Controls

Source		24-Hour µg/m3		Annual µg/m3
Ore Unloading, Crushing and Conveying			49.5	7.4
	o Fugitive	37.0		5.5
	o Process	12.5		1.9
Ray Smelter and Acid Plant			0.8	0.2
Unpaved Roads			9.6	1.2
Paved Roads			32.9	3.6
Locomotives			25.9	2.4
Gypsum			0.0	0.0
All Others			12.4	3.4
Background			16.0	16.0
Total			147.1	34.2
NAAQS			150.0	50.0

Figure 1

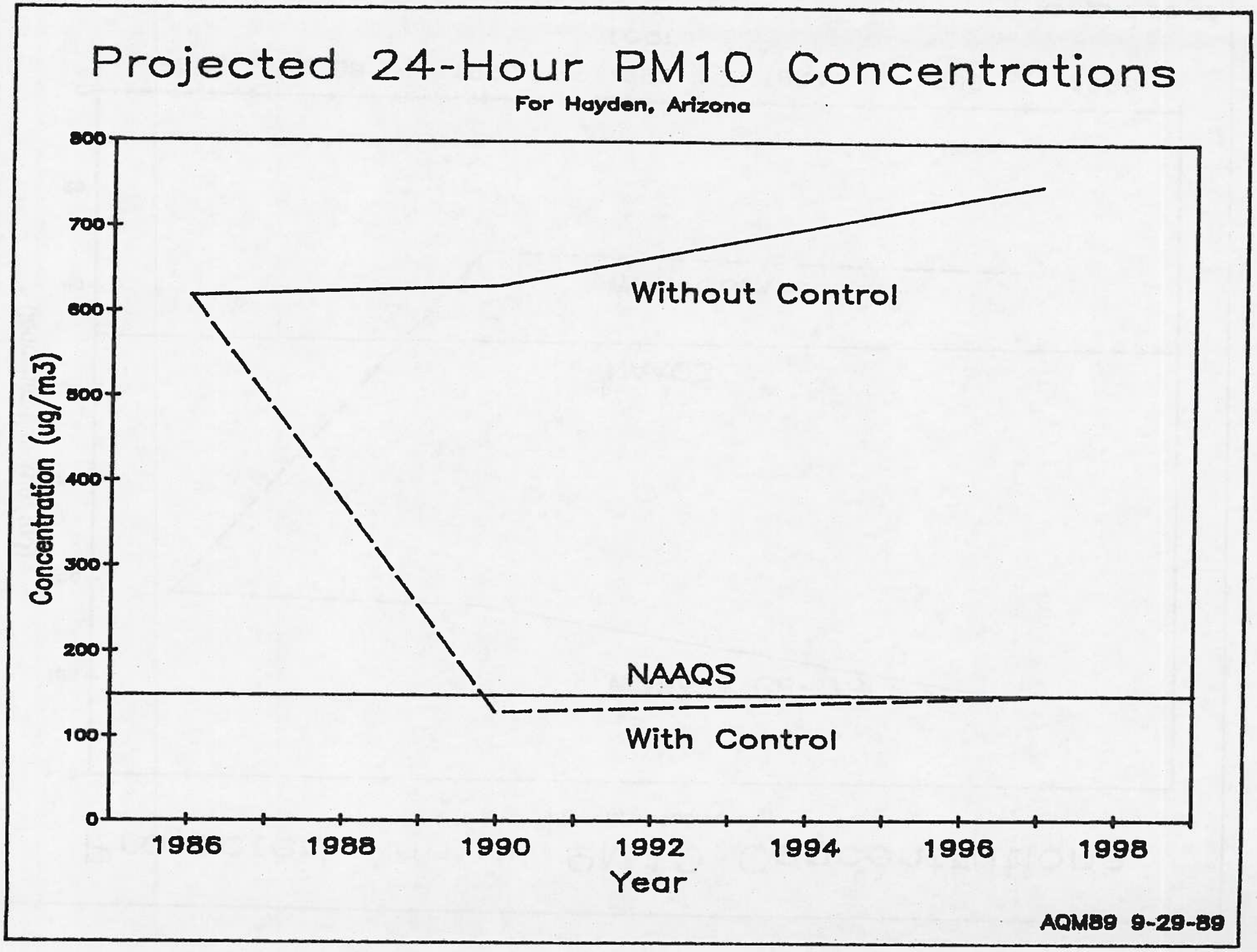
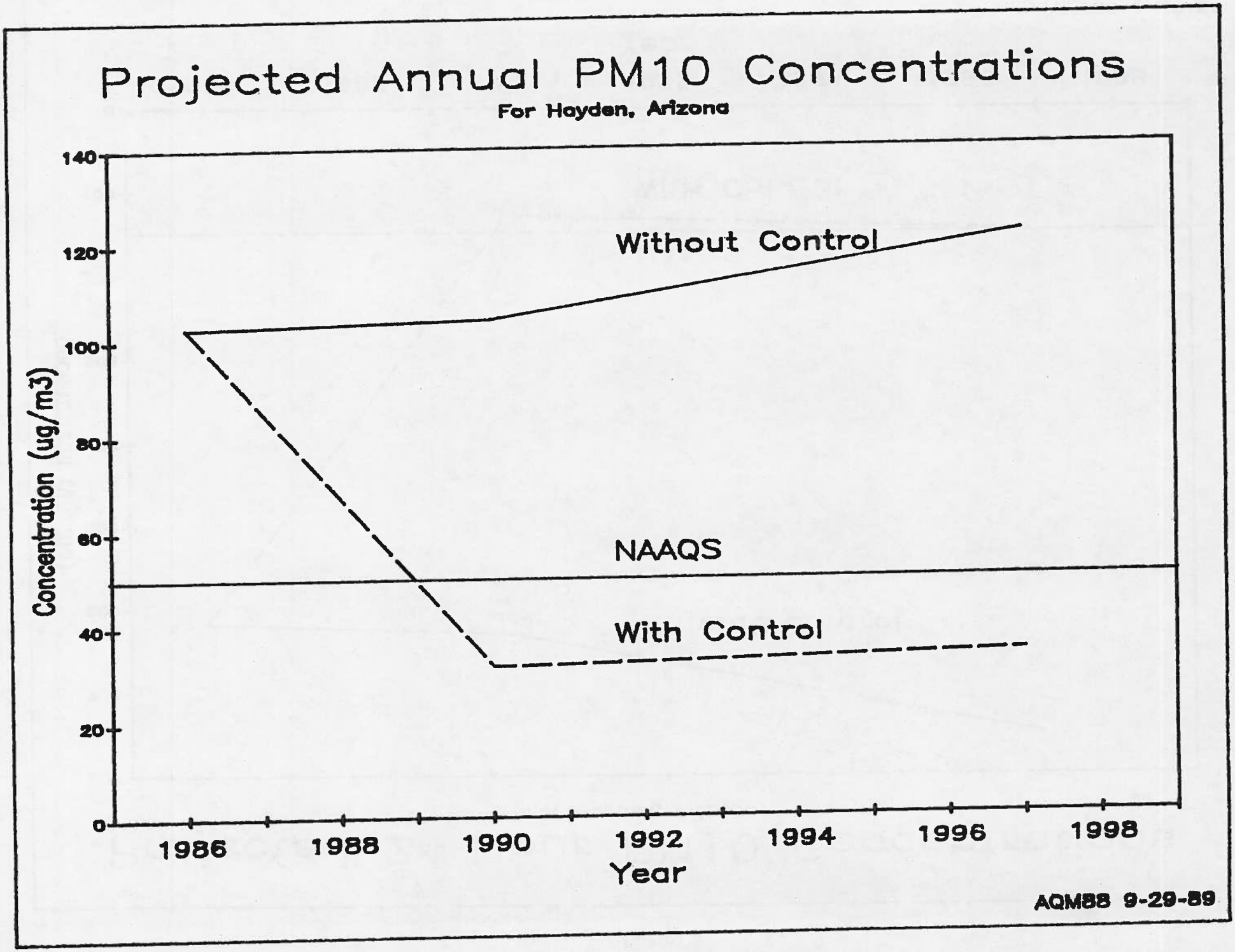

Projected 24-Hour PM10 Concentrations
For Hayden, Arizona
Concentration (ug/m3)
800
700
600
500
400
300
200
100
0
Without Control
NAAQS
With Control
1986
1988
1990
1992
1994
1996
1998
Year
AQM89 9-29-89

Figure 2


Projected Annual PM10 Concentrations
For Hayden, Arizona
Concentration (ug/m3)
140
120
100
80
60
40
20
0
Without Control
NAAQS
With Control
1986
1988
1990
1992
1994
1996
1998
Year
AQM88 9-29-89

1.0 INTRODUCTION

1.1 Purpose

This is the PM_{10} State Implementation Plan (SIP) for the Group I Area of Hayden, Arizona. The purpose of this document is to identify sources of PM_{10} and describe strategies to control PM_{10} emissions in order to achieve and maintain the PM_{10} NAAQS in this area.

To develop the Demonstration PM10 SIP for Hayden, EPA hired Engineering Science (ES) and NEA Inc. to conduct the necessary emission inventory and modeling. The final document was prepared in 1987. This SIP relies on their air quality assessment, however, necessary modifications are made to clarify some of the final results and adopted control strategies.

The PM10 SIP Development Guideline Document (EPA, 1986), hereafter referred to as the Guideline Document, was used by EPA to demonstrate the use of receptor models for dispersion model refinement. A Chemical Mass Balance (CMB) type of receptor model was used in the Hayden example.

This document contains information concerning the development of PM_{10} emission inventories, ambient air quality data, and control strategies for the attainment of National Ambient Air Quality Standards for PM_{10}.

1.2 Background

The 1977 amendments to the Clean Air Act require the Environmental Protection Agency (EPA) at five year intervals to review and, if appropriate, revise the criteria on which each national ambient air quality standard (NAAQS) is based along with the NAAQS themselves. In response to these requirements, EPA reviewed the criteria upon which the particulate matter NAAQS were based including information on health and welfare effects that had become available since the original criteria document was prepared in 1969. The Criteria Document was revised accordingly, and reissued on March 20, 1983.

After considering the information in the revised criteria document, EPA revised the NAAQS for particulate matter. Prior to this action the original particulate matter NAAQS included the size range of particles collected by the hi-volume sampler and referred to as total suspended particulates (TSP). The NAAQS for TSP were promulgated in 1971, with the primary standards of 75 $\mu g/m^3$ for the annual geometric average, and 260 $\mu g/m^3$ for the 24-hour average. The TSP secondary standard was 150 $\mu g/m^3$ for the 24-hour average. The revised primary and secondary NAAQS apply to particulate matter in a size range defined by the collection characteristics of a new ambient reference method that has a 50%

collection efficiency (D50) at 10 micrometers. The material collected by the reference method is nominally below 10 micrometers and is referred to as "PM_{10}". The NAAQS for PM_{10} are 50 $\mu g/m^3$ for the annual arithmetic average and 150 $\mu g/m^3$ for the 24-hour average. The effective date of the revised NAAQS was July 31, 1987.

Due to the lack or the unavailability of PM_{10} data, EPA developed a procedure for estimating the probability of nonattainment of PM_{10} NAAQS, using TSP or PM_{10} data. Based on the probability of exceeding PM_{10} standards (24-hour and annual), EPA has designated three types of areas: 1) Group I areas (95 percent or higher probability), 2) Group II areas (20 percent to 95 percent probability or insufficient data to make firm determination), and 3) Group III areas (less than 20 percent probability). Based on the proposed NAAQS the Hayden, Arizona area has been classified as Group I for the annual and 24-hour average PM_{10} NAAQS. Section 110 of the Clean Air Act requires the State of Arizona to submit revised State implementation Plans (SIPs) that demonstrate attainment of the new NAAQS.

1.3 Study Area Definition

Hayden is located at the southern tip of Gila County, 96 miles southeast of Phoenix and 71 miles north of Tucson. See Figure 1.1. This town is located in a complex terrain at the confluence of the Gila and the San Pedro rivers. Hayden was founded in 1909 as a mining community and became incorporated in 1956.

For Hayden it was determined that the PM_{10} Group I area should remain consistent with the TSP area designation, which the Code of Federal Regulations (40 CFR 81.303) lists as the entire 36 square mile township in which the Town of Hayden is located (T5S,R15E). See Figure 1.2. The main activities within the area are associated with a mining and smelting complex owned and operated by ASARCO Incorporated. The complex consists of a copper crushing plant, mill and concentrator, two smelters (Hayden and Ray, the latter of which is temporarily deactivated), and associated facilities. See Figure 1.3. A complete description of these facilities is provided in section 7 of this document.

FIGURE 1.1

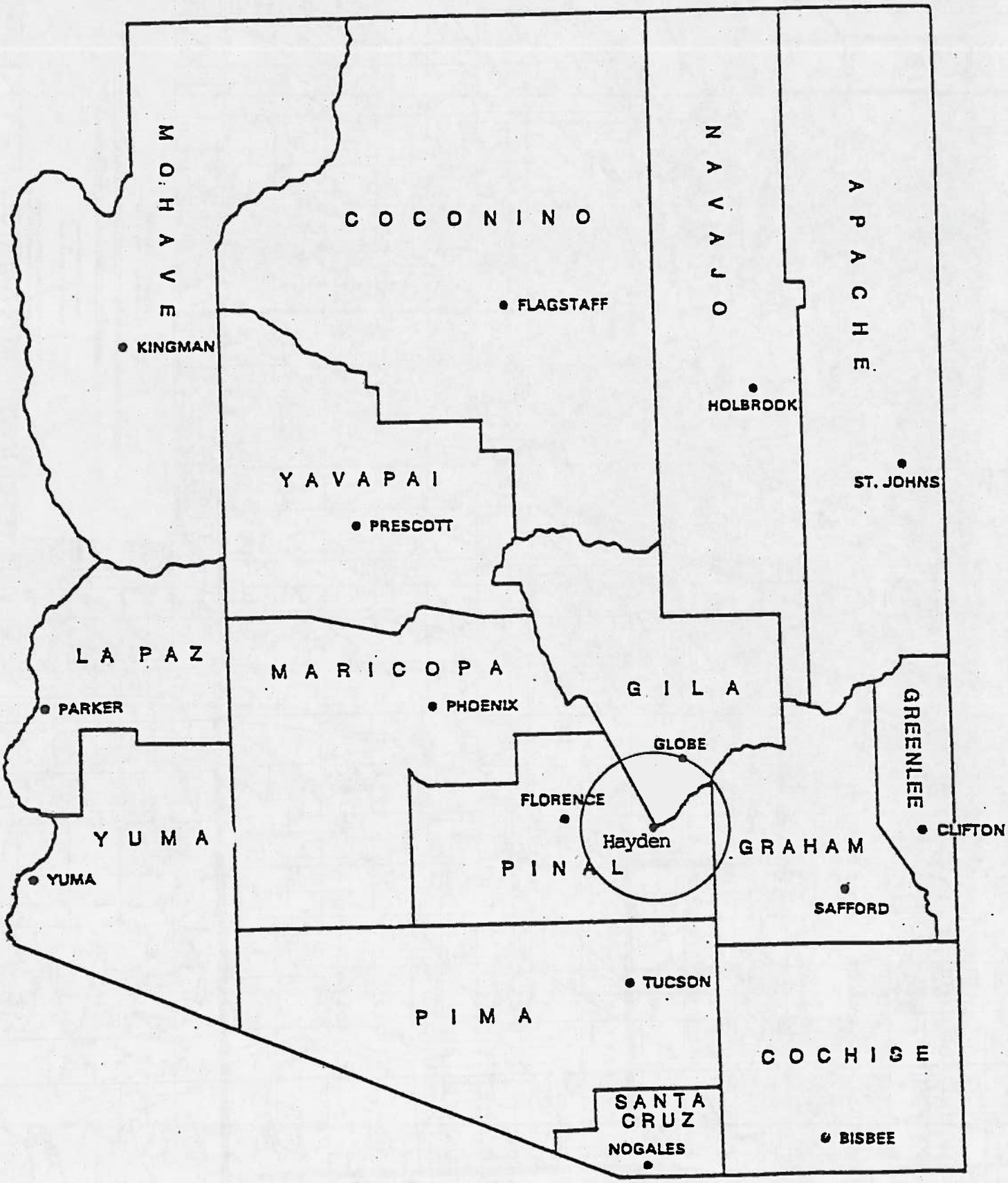

MOHAVE
KINGMAN
COCONINO
FLAGSTAFF
NAVAJO
HOLBROOK
APACHE
ST. JOHNS
YAVAPAI
PRESCOTT
LA PAZ
PARKER
MARICOPA
PHOENIX
GILA
GLOBE
GREENLEE
CLIFTON
FLORENCE
Hayden
YUMA
YUMA
PINAL
GRAHAM
SAFFORD
TUCSON
PIMA
COCHISE
SANTA CRUZ
NOGALES
BISBEE

FIGURE 1.2

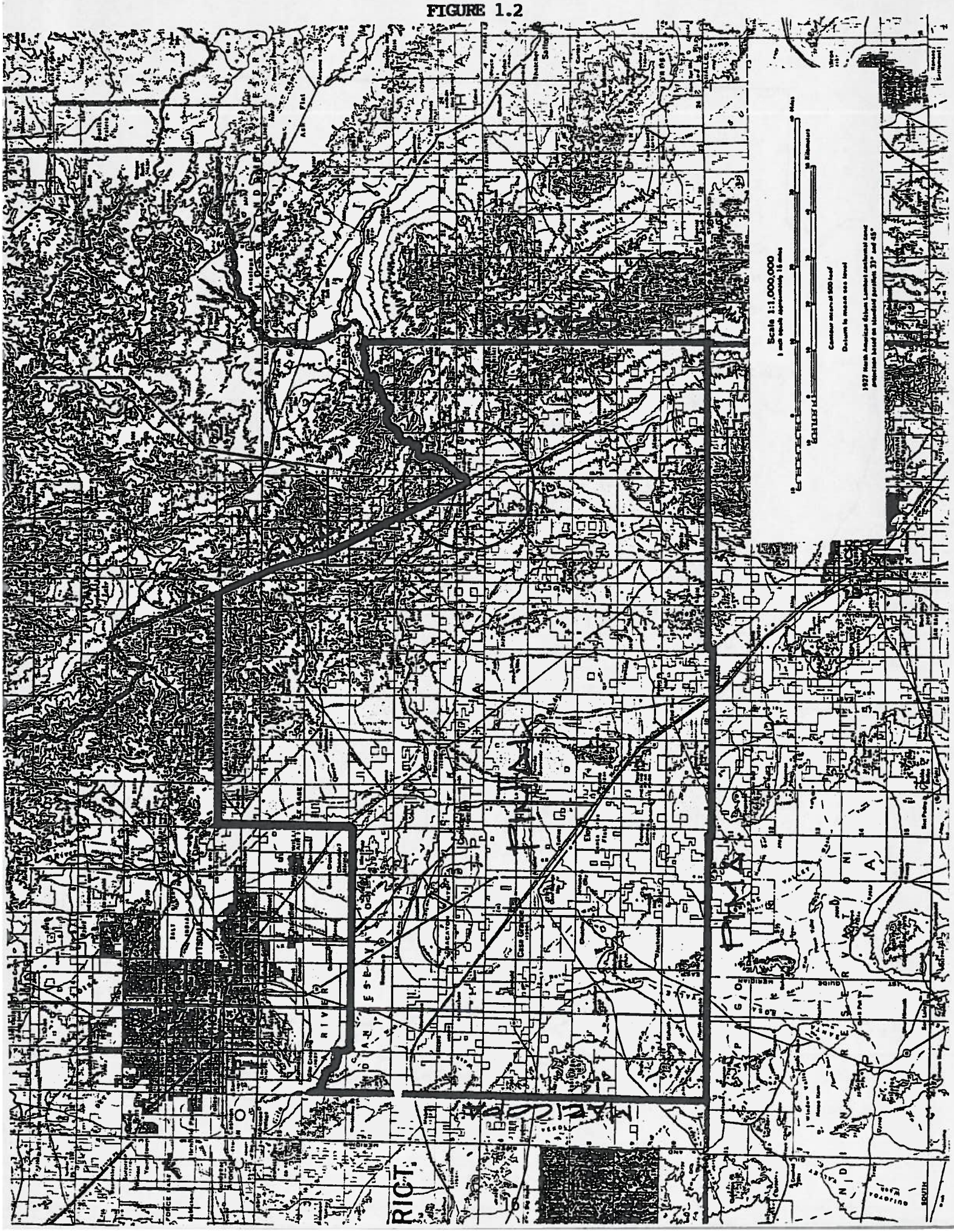
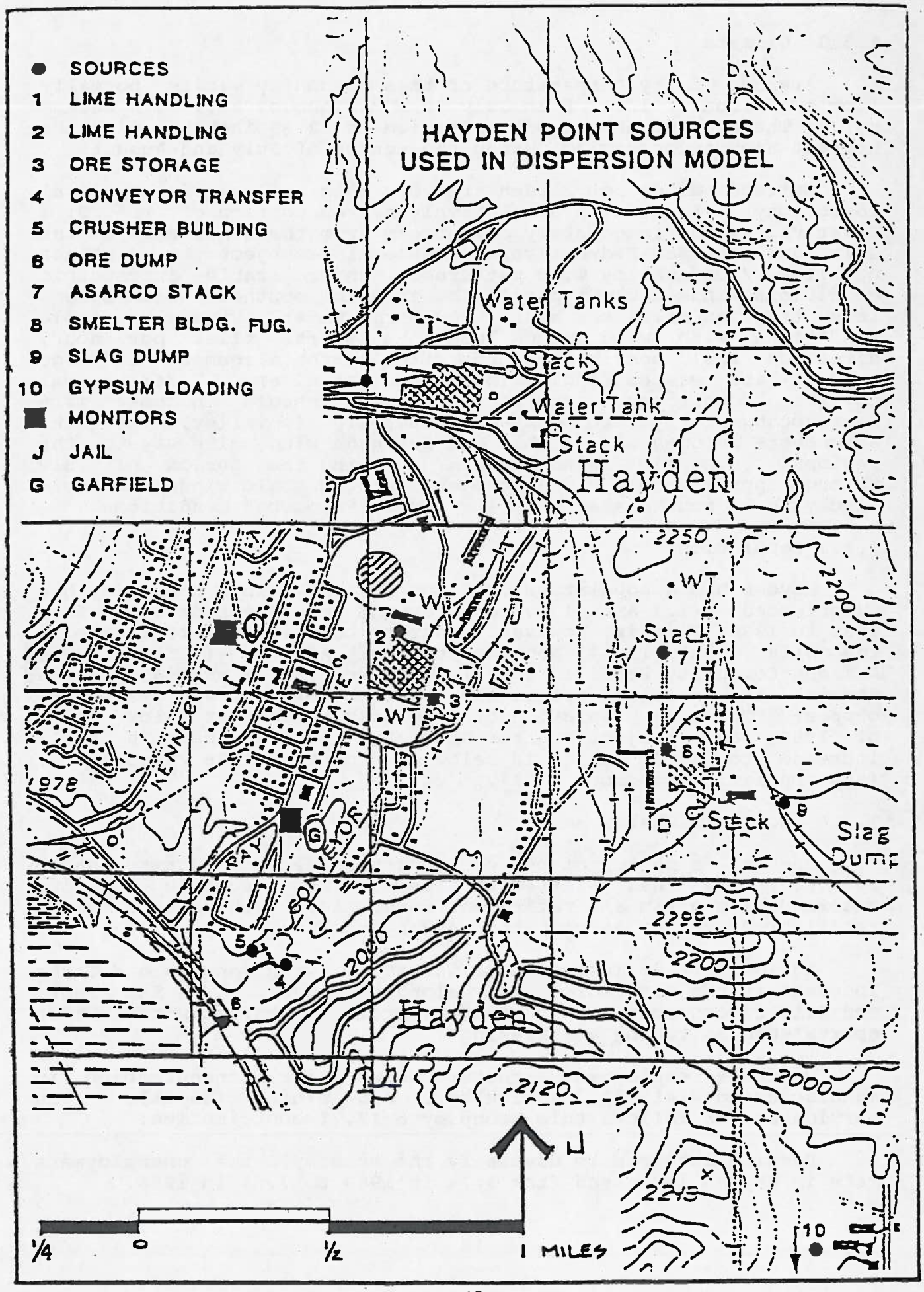

Scale 1:1,000,000
Contour interval 500 feet
Datum is mean sea level
1927 North American datum Lambert conformal conic projection based on standard parallels 33° and 45°
MARICOPA
RICT

FIGURE 1.3


HAYDEN POINT SOURCES
USED IN DISPERSION MODEL
● SOURCES
1 LIME HANDLING
2 LIME HANDLING
3 ORE STORAGE
4 CONVEYOR TRANSFER
5 CRUSHER BUILDING
6 ORE DUMP
7 ASARCO STACK
8 SMELTER BLDG. FUG.
9 SLAG DUMP
10 GYPSUM LOADING
MONITORS
J JAIL
G GARFIELD
Water Tanks
Stack
Water Tank
Stack
Hayden
2250
2200
WT
Stack
Stack
Slag Dump
2295
2200
2000
Hayden
2120
2000
2215
N
1/4
0
1/2
1 MILES

1.3.1 Climate

Average daily temperature of this community varies normally from a maximum of 103.1 F in July to a minimum of 28.9 F in December. The average annual precipitation is 12.89 inches, with the highest amounts occurring during the months of July and August.

Surface winds at Hayden are very much influenced by local topography. Located in a relatively narrow portion of the Gila River valley and immediately downstream from the confluence of the Gila and the San Pedro rivers, Hayden is subject to distinct upvalley / downvalley wind patterns. Under stable atmospheric conditions winds would typically be from the southeast with speeds less than ten miles per hour; however, under extremely stable conditions with wind speeds less than several miles per hour, direction would possibly be controlled by the alignment of side canyons and washes feeding into the Gila River. Under normal daytime conditions, the surface wind should become more west-southwesterly to west-northwesterly (upvalley) as the atmosphere becomes less stable and drainage winds give way to the regional (synoptic) wind pattern. During the period of July through approximately mid-September synoptic scale winds are more likely to be southeasterly during summer "monsoon" conditions.

1.3.3 Population

Hayden had a population of 1,100 in 1986. This community has experienced a 1.3 annual average percent population decline from 1980 to 1986. This is, however, contrary to the level of growth in the Gila County (1.1%) and the State of Arizona (3.5%). (See Arizona Community Profile, 1987.) ~~This decline is partially due a decline in smelting activities, reflecting a lower price of copper.~~ The 1988 population of this city remains at a low level of 1050, and projections for the year 2000 indicate a small increase to 1080, which is below that of the 1986 population. (See Population Handbook, 1987.)

1.3.4 Economic Status

Due to a period of copper production decline during early 1980's, Hayden has started to diversify its economic base to accommodate tourism and retirement facilities. There is a small retail trade sector serving the Hayden populace.

Agriculture is important to the area, with ranches and farms located in the San Pedro valley along the river. The San Pedro and Gila rivers converge in Hayden, providing Hayden with summer sports such as tubing and fishing.

Hayden's employment structure shows major concentration in manufacturing (41.8%), agriculture and mining (25.6%). The service sector follows this group by a 17.7% contribution.

Despite attempts to diversify the economy, the unemployment rate in Hayden increased from 3.7% in 1980 to 7.6% in 1986.

1.4 General SIP Approach

The basic approach of this plan, as explained in the Guideline Document, will be to present: (1) air quality data; (2) an inventory of the sources contributing to the problem; (3) a determination of the areas where air quality needs improvement, with the aid of simulation models; (4) a determination of the degree of improvement necessary; (5) strategies to reduce emissions sufficient to bring about attainment; (6) commitment to implement the strategies; and (7) steps necessary to ensure that NAAQS are not violated in the future.

1.5 Plan Contents

Section 2 of this SIP describes air quality data bases used to determine nonattainment status, and describes the development of an ambient speciation profile for receptor modeling. It also describes the receptor model source speciation data base and the mass PM_{10} data base used for preliminary dispersion modeling. Section 2 also defines the meteorology of the area and the meteorological input to the dispersion model.

Section 3 demonstrates the use of measured size specific and speciated source profile data in receptor model Chemical Mass Balance (CMB) equations. It also describes the validation procedures involving statistical comparison techniques with measured size specific and speciated ambient air quality data.

Section 4 describes the receptor and dispersion model reconciliation procedures and the resultant emissions inventory reflecting the reconciliations.

Section 5 shows the base year modeling and development of 24 hour and annual maximum design concentrations from which to base control strategies.

Section 6 describes development and modeling of source specific control strategy options and projected air quality for 1990 and 1997 using growth estimates and control strategies.

Section 7 describes control strategy implementation methodology and schedule.

Section 8 contains a summary of this plan and implementation timelines for the adopted control strategies.

Section 9 contains the State's commitment to conduct ambient PM_{10} Sampling.

Section 10 describes the State's preconstruction review program and status.

Section 11 contains the demonstration of NAAQS maintenance through 1997. It also describes the State's contingency plan, if future violation were to occur.

Section 12 lists the State's commitment to submit Reasonable Further Progress Reports.

The appendices contain the completed report prepared by NEA Inc. for the CMB analysis and receptor modeling, operating and installation permits for both of the ASARCO operations (Hayden and Ray Units), public hearing announcements, public comments, ADEQ's responsiveness summary, and other supporting documents.

2.0 DATA BASE DEVELOPMENT

The Guideline Document recommends combined use of receptor and dispersion models as the preferred method of establishing PM_{10} source-receptor relationships. In a discussion of receptor models it describes the CMB method as the most advanced.

CMB requires speciated data for both the ambient air and the emission sources, and can be further enhanced by fractionated sampling data such as that obtained with a dichotomous sampler. The Guideline Document recommends that at least 80 percent of the ambient PM_{10} be identified by source characterization. The dispersion modeling requires precise locations of all major sources and the ambient monitors; a general estimate of the mass PM_{10} emissions from each source (emissions inventory); and meteorological data consisting of wind speed and direction frequencies, and mixing height on specific days and on an annual basis.

The historical ambient air monitoring data collected in the Hayden area determined the nonattainment status and the classification of Hayden as a Group I area. Data from a size selective inlet (SSI) PM_{10} monitor and two dichotomous samplers (which were temporarily installed to obtain speciated and size specific air quality data for receptor modeling) provided more information for the air quality data base. Source data were obtained from a source speciation test program and a preliminary PM_{10} mass emissions inventory. Meteorological data were obtained from the ASARCO meteorological station in downtown Hayden and other local meteorological stations, and also from the Tucson airport. Speciation data for sources not tested were determined from speciation libraries. The following subsections describe the ambient characterization, the source characterization, and the meteorological data base developed for the Hayden SIP.

2.1 Air Quality

2.1.1 Existing Air Quality Data

The Arizona Department of Environmental Quality (ADEQ) has operated a SSI PM_{10} sampler at the Hayden Jail Monitoring Site since February, 1985, and has operated a TSP monitor at that same location for preceding years. Table 2.1 shows approximately 4 years of available PM_{10} data and four years of TSP data. The monitoring results show exceedances of the PM_{10} NAAQS of 50 $\mu g/m^3$ (annual arithmetic mean) and the 150 $\mu g/m^3$ (24-hour average) and also exceedances of the TSP annual geometric mean standard of 75 $\mu g/m^3$ and 24-hour standard of 260 $\mu g/m^3$.

Table 2.1

Measured Air Quality at the Hayden Jail Site *

Pollutants Averaging Times, & No. of Samples	1983	1984	1985	1986	1987**	1988**
PM10 (µg/m3)						
Annual Arith. Mean			68	80	56	52
Max. 24-hour			157	243	189	190
2nd High 24-hour			146	151	170	176
No. of Samples			57	60	56	52
TSP(µg/m3)						
Annual Geom. Mean	98	122	123	158		
Max 24-hour	337	514	378	318		
2nd High 24-hour	294	301	271	272		
No. of Samples	53	58	58	61		

* Does not include dichotomous sampler data collected December 1986 through January 1987.

** Data collected using a Wedding Sampler

Chapter 2 of the Guideline Document describes uncertainties in data measured with the Sierra Anderson SA321A PM_{10} monitors, such as the monitor used at the Hayden Jail site, and the use of a 20 percent "gray zone" around the standard (Note: since 1987 PM_{10} data have been collected using a Wedding Sampler). Even allowing for the 20 percent "gray zone" the Jail measurements still show exceedances of the NAAQS. The Wedding data for 1987 and 1988 confirm this finding. Using information from the EPA Procedures for Estimating Probability of Nonattainment of a PM10 NAAQS Using Total Suspended Particulate or PM10 Data, referenced in the Guideline Document, and the 0.47 TSP to PM_{10} adaptation factor in the Guideline Document, the measured TSP data also indicate exceedances of the NAAQS for PM_{10}.

2.1.2 Special PM_{10} Monitoring for SIP

Dichotomous samplers using Teflon filters to aid in speciation analysis were used to collect size specific air quality data at the Hayden Jail site and at the Garfield Street site in Hayden from the beginning of December 1986 through January 1987. The two months of speciated data were subsequently used in the CMB model and compared with ISC dispersion model results. Sampling for a full year period would have allowed assessment of the impact of seasonal sources and annual variation of weather.

Both the fine and coarse fraction dichotomous sampler filters from each location were desiccated and weighed to determine total mass and then examined with X-Ray Fluorescence (XRF) for elemental analysis. The speciation analysis and particle coarse and fine size data provided input to the CMB determinations. For mass PM_{10} concentrations (determined from the sum of the fine and coarse dichotomous filter concentrations), the 12 samples collected at the Hayden Jail and the 13 samples collected at the Garfield site showed arithmetic means of 105 $\mu g/m^3$ and 59 $\mu g/m^3$ respectively, indicating that one year of sampling would result in annual standard exceedances. Two of the 25 samples collected exceeded the 150 $\mu g/m^3$ 24-hour standard.

2.2 Receptor Modeling Data Base

NEA, Inc. conducted the sample collection and analysis program and the receptor modeling for Hayden. NEA's report "Source Apportionment of Suspended Particles and Toxic Elements in Hayden, Arizona," hereafter referred to as the NEA Report, is paraphrased in this report and contained in its entirety as Appendix A.

2.2.1 Receptor Model Selection

The Guideline Document lists the several factors affecting the choice of receptor models and states that Chemical Mass Balance is considered the most advanced of the receptor methods. Review of these factors relating to the conditions at Hayden resulted in selection of the CMB approach to best establish source receptor relationships.

2.2.2 Ambient Profile Development

- Ambient Monitoring Sites

Two ambient monitoring sites separated by about one half mile, were used to collect ambient particulate samples (See Figure 1.3). A dichotomous sampler was located at the Hayden jail site southeast of the Kennecott and Canyon Road intersection, and the second dichotomous sampler was located at the Hayden City Maintenance Yard on Garfield Avenue a few hundred yards uphill from the ore crusher building. The Hayden Jail site was equipped with a TSP and SSI PM_{10} monitor in addition to the dichotomous sampler.

- Sampling Schedule

All samples collected were 24-hour, midnight to midnight samples. Sampling started on November 28, 1986, and continued through January 31, 1987, at both sites. Dichotomous samples were collected every third day at both sites from November 28, 1986, to December 7, 1986, and on an every day schedule from January 27, 1987, through January 31, 1987, the latter during the period when source samples were collected at the smelter. From December 18, 1986, through January 12, 1987, samples were collected at the Hayden Jail site on a schedule of two days on and two days off, while samples were collected every day for three days at the Garfield site with only one day off. In all, 114 fine and coarse-cut samples were collected at the Hayden Jail and Garfield sites. The sampling period, though limited, was likely representative of meteorological conditions that would be experienced during the season when ambient PM_{10} concentrations are typically at a maximum.

- Ambient Filter Selection

Filters selected for chemical analysis and source apportionment represented worst case dichotomous PM_{10} days, as well as days representing conditions that might enhance the impacts of specific sources. The selection criteria used in order of importance were as follows:

- High PM_{10} Values
- Predominant Wind Direction
- Wind Speed
- Fine to Coarse Ratios
- Plant Operations
- Days of Week
- Unusual Events

The days and filters selected, their key features, and selection criteria are summarized in Table 2.2. The wind speed and direction on the fifteen days selected were grouped into five regimes based on wind speed and direction, as indicated in Table 2.3. The number of days selected from each regime is generally typical of their historical frequency of occurrence.

TABLE 2.2.

SUMMARY OF KEY FEATURES
FOR SAMPLING DAYS SELECTED FOR ANALYSIS AND SOURCE APPORTIONMENT

Date/Day	Site	Filter ID Particle Size		Wind Speed (mph)	Wind Direction*	F/C Ratio	Dichot PM_{10} ($\mu g/m^3$)	Comments & Selection Criteria
11/22/86 Saturday	1	P0591	F	2.4	261	0.254	70.85	Furnace down 0200-0530 Moderate PM_{10} values and wind from the west
		P0590	C					
	2	P0595	F			0.288	72.24	
		P0594	C					
12/1/86 Monday	1	P0597	F	2.1	106	0.318	99.27	2nd High PM_{10} (Site 1 & 2) Furnace down 0630-0830
		P0596	C					
	2	P0603	F			0.211	160.20	
		P0602	C					
12/4/86 Thursday	1	P0609	F	3.2	121	0.337	126.91	Highest PM_{10} (Site 1)
		P0608	C					
	2	P0605	F			0.232	147.46	
		P0604	C					
12/9/86 Tuesday	1	P0619	F	1.4	229	0.265	55.72	All systems down 0130-1430
		P0618	C					
12/18/86 Thursday	1	P0675	F	1.3	156	0.739	25.48	Highest F/C ratio Wind gusts from the west
		P0674	C					
	2	P0679	F			0.331	46.93	
		P0678	C					
12/24/86 Wednesday	1	P0687	F	0.9	211	0.405	45.40	Holiday High F/C ratios
		P0686	C					
	2	P0689	F			0.452	42.99	
		P0688	C					
12/28/86 Sunday	2	P0701	F	3.9	76	0.112	109.65	Furnace down 1130-1530
		P0700	C					
12/29/86 Monday	2	P0703	F	6.2	79	0.065	235.69	Highest PM_{10} (Site 2) Lowest F/C ratio Furnace down 0900-1200
		P0702	C					

TABLE 2.2. (Cont'd)

Date/Day	Site	Filter ID Particle	Size	Wind Speed (mph)	Wind Direction*	F/C Ratio	Dichot PM_{10} ($\mu g/m^3$)	Comments & Selection Criteria
1/4/87 Sunday	1	P0715	F	4.8	116	0.396	48.04	
		P0714	C					
1/7/87 Wednesday	1	P0751	F	0.8	181	0.502	34.09	All systems down 0630-1830 Stagnant conditions
		P0750	C					
	2	P0755	F			0.187	62.19	Lowest average wind speed
		P0754	C					
1/11/87 Sunday	1	P0761	F	6.6	81	0.218	34.36	Furnace down 2000-2230 Windy, low F/C ratio
		P0760	C					
	2	P0763	F			0.056	126.69	
		P0762	C					
1/12/87 Monday	2	P0767	F	5.0	86	0.165	111.06	Furnace down 0930-1200 and 1730-1800
		P0768	C					
1/27/87 Tuesday	1	P0783	F	4.5	132	0.232	56.87	
		P0784	C					
	2	P0779	C			0.394	31.91	
		P0780	E					
1/28/87 Wednesday	1	P0785	F	1.6	161	0.314	78.03	Furnace down 2130-2400
		P0786	C					
	2	P0781	F			0.330	82.87	
		P0782	C					
1/30/87 Friday	1	P0791	F	2.4	124	0.180	71.47	Rain, F/C ratios low and PM_{10} values relatively high
		P0792	C					
	2	P0787	F			0.086	128.47	
		P0788	C					

*Wind direction based upon 360° circle. Winds out of due geographic north would measure 0°, due east 90°, due south 180°, and winds out of due west 270°.

TABLE 2.3

DAYS INCLUDED IN METEOROLOGICAL REGIMES
AND REGIME CHARACTERISTICS

No.	Description	Speed/Direction	Dates Included
1	High wind speed from the East	(>5 mph, 79°-86°)	12/29/86, 1/11/87 1/12/87
2	Low wind speed from the South	(<1.6 mph, 156°-211°)	12/9/86, 12/18/86 12/24/86, 1/7/87 1/28/87
3	Moderate wind speed from the Southeast	(>2,<5, 106°-132°)	12/1/86, 12/4/86 1/4/87, 1/27/87 1/30/87
4	Moderate wind speed from the West	(2.4, 261°)	11/22/86
5	Moderate wind speed from the East	(3.9, 76°)	12/28/86

The average wind speeds listed are twenty-four hour averages from five monitoring sites operated by ASARCO. Although the average wind speed on the highest wind speed days (Regime 1) was less than 6.3 mph, short term average wind speeds to 24 mph were recorded, and wind speeds in excess of 15 mph accounted for a significant portion of the sampling period.

2.2.3 Source Profile Development

- Sample Collection

Composition profiles representing emissions from sources expected to significantly impact the ambient monitoring sites were developed by direct characterization of emissions from Hayden area sources and based on profiles reported in Core, et. al. (1984). Samples representing area fugitive dust and process fugitive emissions were collected and characterized by procedures similar to those used to characterize ambient aerosols. Process fugitives, such as those from slag skimming, matte tapping, conveyor operations and slag pouring were characterized by sample collection on-site using a sampler developed by NEA, Inc. This sampler incorporates the dichotomous sampler principle and uses a dilution chamber to allow isokinetic sample collection. The test team collected samples of emissions from the secondary converter hoods, the matte tapping and slag skimming of the flash furnace, the slag pouring operation, and the ore crusher. The NEA Report (Appendix A) describes the testing of each source.

Non-process fugitive sources were characterized by collection of bulk samples which were then resuspended and collected onto dichotomous filters in the laboratory. This method was used for characterization of unpaved roads, areas of disturbed soil, ore concentrate charged to the furnace, settled dust in the ore crusher area, and the smelter tailings pile. The composition of several samples prior to resuspension allowed more comprehensive characterization.

- Selection of Filter Samples for Analysis

Filter samples collected from sources of fugitive emissions are listed in Tables 2.4 and 2.5. A total of nineteen of the process fugitive emission filters were selected for analysis as indicated by asterisks in Table 2.4. The criteria for selection included optimum deposit mass, uniformity of deposit, duration of sampling, availability of other filters representing the same process and resource limitations. All of the resuspension filters listed in Table 2.5 were analyzed.

TABLE 2.4

SUMMARY OF SAMPLING DATA
FOR PROCESS EMISSIONS
COLLECTED AT THE ASARCO-HAYDEN COPPER SMELTER

Filter ID	Run #	Source Description	Particle Size	Sample Time (start/stop)	Duration (min.)	Volume (m3)	Temperature (deg. C) Flue	Ambient	D. Chamber	Corrected Mass (ug)	Comments
*P0949	1	Slag skim; flash furnace	<2.5	27:1332-1402	30.0	0.50	34	26	35	8372	E
*P0950	1	Slag skim; flash furnace	>2.5 & <10	27:1332-1402	30.0	0.50	34	26	35	870	E
P0951	2	Matte & slag tap; flash furn.	<2.5	27:1510-1521	10.8	0.18	34	26	33	1934	E
P0952	2	Matte & slag tap; flash furn.	>2.5 & <10	27:1510-1521	10.8	0.18	34	26	33	154	A,E
*P0953	3	Matte tap; flash furnace	<2.5	27:1541-1557	16.2	0.27	36	25	32	10252	E
*P0954	3	Matte tap; flash furnace	>2.5 & <10	27:1541-1557	16.2	0.27	36	25	32	682	B,E
*P0955	4	Matte tap; flash furnace	<2.5	27:1608-1620	11.4	0.19	50	25	35	14579	E
*P0956	4	Matte tap; flash furnace	>2.5 & <10	27:1608-1620	11.4	0.19	50	25	35	994	B,E
P0957	5	Matte & slag tap; flash furn.	<2.5	27:1638-1654	15.6	0.26	55	24	39	30577	E
P0958	5	Matte & slag tap; flash furn.	>2.5 & <10	27:1638-1654	15.6	0.26	55	24	39	2071	A,E
*P0961	6	Slag skim; flash furnace	<2.5	28:0811-0825	14.4	0.24	34	9	20	2934	E
*P0962	6	Slag skim; flash furnace	>2.5 & <10	28:0811-0825	14.4	0.24	34	9	20	354	E
*P0965	2	Secondary converter ducting	<2.5	28:1624-1700	36.6	0.61	82	31	35	17381	E
*P0966	2	Secondary converter ducting	>2.5 & <10	28:1624-1700	36.6	0.61	82	31	35	924	E
*P0967	3	Secondary converter ducting	<2.5	28:1713-1745	32.4	0.54	89	27	32	15072	E
*P0968	3	Secondary converter ducting	>2.5 & <10	28:1713-1745	32.4	0.54	89	27	32	1311	E
*P0969	4	Secondary converter ducting	<2.5	28:1800-1822	21.6	0.36	110	23	28	5407	E
*P0970	4	Secondary converter ducting	>2.5 & <10	28:1800-1822	21.6	0.36	110	23	28	355	E
*P0971	1	Slag pour	<2.5	29:1541-1544	3.0	0.05	--	34	35	1102	E
*P0972	1	Slag pour	>2.5 & <10	29:1541-1544	3.0	0.05	--	34	35	51	E,C
*P0973	2	Slag pour	<2.5	29:1630-1634	3.6	0.06	--	30	35	1252	E
*P0974	2	Slag pour	>2.5 & <10	29:1630-1634	3.6	0.06	--	30	35	69	E,C
*P0975	1	Ore crusher building	<2.5	29:0914-1159	165.0	2.76	--	--	--	412	E
P0976	1	Ore crusher building	>2.5 & <10	29:0914-1159	165.0	2.76	--	--	--	--	D,E
P0977	2	Ore crusher building	<2.5	29:1413-1631	138.0	2.30	--	--	--	3366	E
P0978	2	Ore crusher building	>2.5 & <10	29:1413-1631	138.0	2.30	--	--	--	--	D,E

Comment Key:
- A: Combination of slag skimming and matte tap
- B: Two consecutive matte taps during sample time
- C: Two slag pours per filter pair; coarse filter collimated
- D: All three crushers running
- E: 37 mm Teflon membrane

* Filters selected for XRF analysis.

TABLE 2.5

Summary of ASARCO-Hayden Resuspension Data

Description	Sample Type*	Filter ID	Final Net Deposit (ug)	Ratio of Net Intermediate Fine to Net Coarse
Charged ore mixture	dichot fine dichot coarse	P1029 P1030	182 2361	0.076 (1:13)
Composited Smelter Yard and Road Dust	dichot fine dichot coarse	P1031 P1032	200 2489	0.076 (1:13)
Dust from Ore Crusher	dichot fine dichot coarse	P1033 P1034	199 2555	0.042 (1:24)

*Fine is <2.5 um, Coarse is 2.5 um - 10 um.

2.3 Dispersion Modeling Data Base

2.3.1 Model Selection

The first step in establishing a data base for dispersion modeling analysis is to determine the appropriate model to be used. For Hayden, an EPA approved model, Industrial Source Complex Short-Term (ISCST) Version 6.0 was selected for evaluating PM_{10} impacts. This model was selected because of its ability to:

- model point, area and volume sources;
- calculate combined impacts for selected source groups;
- vary windblown dust source emissions as a function of wind speed;
- calculate short-term (1 to 24-hour) and long-term (annual) concentration using hourly-sequential meteorological data;
- calculate concentrations at designated receptor locations (i.e. ambient monitoring stations).

This model allows for the evaluation of PM_{10} impacts using an emission inventory of the study area (containing both area and point sources) and hourly meteorological data. The ability of the model to group sources aids in the comparison and reconciliation of modeled results with the results from the CMB receptor modeling analysis.

2.3.2 Emission Inventory

An emission inventory of the PM_{10} sources within the study area must be compiled for input into the dispersion model. The inventory should contain source locations as well as PM_{10} emission rates and release parameters. The emission rates are generally based on published or site-specific emission factors and known or estimated activity levels.

Ideally, two types of inventories would be created: day-specific and annual-average. The former would be used in the receptor/dispersion reconciliation analysis while the latter would be used for control strategy development. Typically, however, day-specific activity information is not available and only an estimated annual-average inventory is available for modeling purposes. For Hayden, the annual-average emission inventory was used for both model reconciliation and control strategy development modeling.

TABLE 2.6

Summary of 1986 PM_{10} Emission Inventory
for Hayden, AZ

Source Category	Source Type[a]	Annual-Average Emission Rate (ton/yr)
Automobile Exhaust (including brake and tire wear)	A	2.0
Roadway Dust	A	35.4
Woodburning Stoves	A	0.3
Copper Ore Tailings	A	84.9
Locomotive Exhaust	A	5.3
Windblown Dust	A	2.3
ASARCO Smelter Stack	P	87.5
ASARCO Smelter Building Fugitives	P	17.7
ASARCO Slag Dump	P	40.6
Copper Ore	P	15.3
Ore Crusher	P	59.8
Lime Handling	P	13.2
Gypsum	P	13.2
Total		377.5

[a] A = area source, P = point source

Annual-average PM_{10} emissions in the Hayden area were estimated based on 1986 activity levels and assigned to the 13 general categories given in Table 2.6. The total emissions from the 136 area sources and 10 point sources contained within the study area are summarized in Table 2.6. The area sources were the tailings pile south and west of Hayden, the railroad activity south of Hayden near the ore dump area, the windblown dust from disturbed soil areas in the smelter and town areas, and the tailings and fugitive emissions from traffic on paved and unpaved streets and roads. Figure 2.1 shows the point sources and monitor locations in Hayden. The actual inventory, containing the source locations, emission factors, emission rates, release parameters and other descriptive information is contained in Appendix B.

2.3.3 Meteorological Data

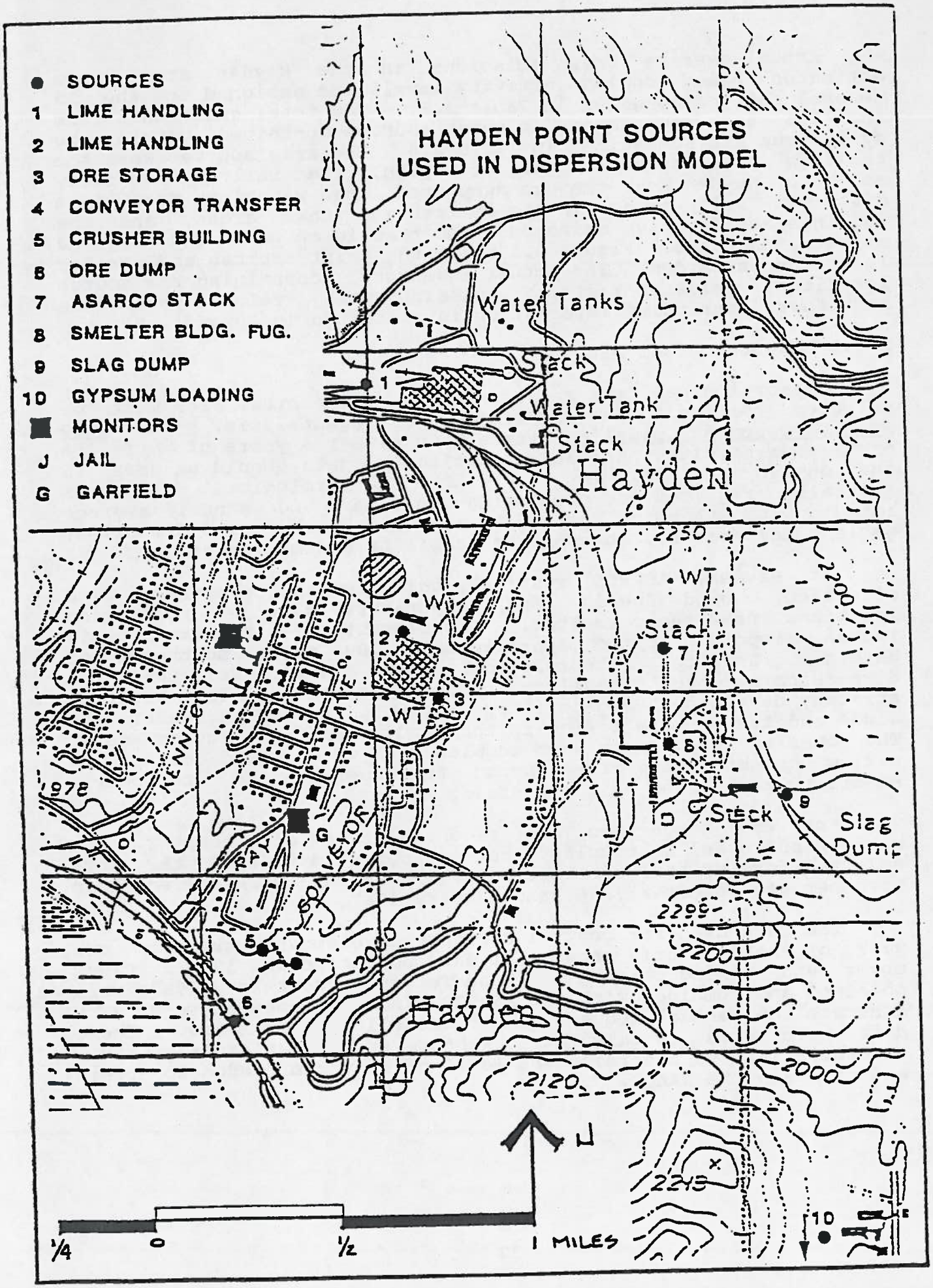
Meteorological data representative of the study area must be selected for use in the dispersion modeling analysis. The PM10 SIP Development Guideline states that either 5 years of off-site or 1 year of site-specific meteorological data should be used in the development of a PM_{10} SIP. The meteorological parameters generally required for predicting short-term and annual average impacts with EPA guideline models are wind speed, wind direction, ambient temperature, atmospheric stability and mixing height.

At Hayden, ASARCO routinely collects and processes wind direction, wind speed, and temperature data at monitoring locations near their smelter. The closest off-site station is Tucson airport located approximately 100 miles southwest of Hayden. On-site meteorological data were selected for dispersion/receptor modeling reconciliation and for control strategy development because they were more representative of the wind and temperature fields in the study area than Tucson data. The on-site wind data were supplemented with cloud cover and mixing height data from Tucson to generate the atmospheric stability and mixing height profile.

For the comparison and reconciliation of receptor and dispersion modeling results, meteorological data from the days selected for CMB analysis were used. These data were collected in November and December 1986, and January 1987.

The data used for control strategy development were from one year of ASARCO hourly sequential data collected in 1983. Cloud cover and mixing heights from the Tucson airport for 1983 were obtained and combined with the ASARCO wind and temperature data to generate an annual sequential meteorological data base. These data were used to calculate 24-hour and annual-average PM_{10} concentrations to determine the level of controls needed to attain and maintain the NAAQS.

FIGURE 2.1



HAYDEN POINT SOURCES
USED IN DISPERSION MODEL
SOURCES
1 LIME HANDLING
2 LIME HANDLING
3 ORE STORAGE
4 CONVEYOR TRANSFER
5 CRUSHER BUILDING
6 ORE DUMP
7 ASARCO STACK
8 SMELTER BLDG. FUG.
9 SLAG DUMP
10 GYPSUM LOADING
MONITORS
J JAIL
G GARFIELD
Water Tanks
Stack
Water Tank
Stack
Hayden
2250
WT
Stack
Stack
Slag Dump
2200
2000
2120
Hayden
1978
KENNECOTT
CONVEYOR
N
1/4
0
1/2
1 MILES

3.0 CMB RESULTS AND MODEL VALIDATION

The CMB provides a source contribution estimate (SCE) and degree of accuracy (a statistic called standard error) for each source category that is chosen beforehand for consideration with the model. The model produces this estimate by making an effective variance weighted least squares "fit" which considers the chemical composition of the ambient sample and the composition of the sources. It estimates what amounts of each source (the SCE's) will collectively best "explain" the chemistry of the ambient sample. Generally, it is desirable to obtain the best "fit" possible given the physical constraints of the models assumptions and also to obtain SCE's with low standard errors.

Initial steps for this modeling are to organize data and perform the chemical mass balance calculations, followed by validation procedures to evaluate and adjust the results. The first portion of this section describes the data collection and analytical results such as measured mass, ambient and source particulate chemistry, and the results of the model calculations.

The second portion of this section describes the validation procedures and the final model results.

3.1 Analytical and CMB Results

3.1.1 Measured Particulate Mass Concentrations

Coarse and fine dichotomous sampler results and total PM_{10} concentrations were used as part of the filter selection criteria for CMB analysis. The results also define the ambient PM_{10} concentrations relative to the NAAQS. Fine to coarse to coarse ratio is important in distinguishing the fuel combustion and industrial processes, involving combustion, chemical reaction or condensation of vapors, from that of wind blown dust, agricultural activities, resuspended road dust, and fugitive emissions from industrial process sources.

The Hayden dichotomous monitors operated during an approximate two month period from November 22, 1986 through January 30, 1987; the Hayden Jail site monitor collected 30 samples during that period, and the Garfield monitor collected 24 samples. Each sample consisted of a PM2.5 fraction and a PM2.5-10 fraction. On two occasions the monitors collected two samples during a 24-hour period to assess diurnal influences. The NEA Report lists the results for each sampling period. Table 3.1 lists the mean concentrations and ranges of all samples collected, and the mean of the 12 selected days for the Hayden Jail site on the 13 selected days for the Garfield site.

The highest PM_{10} value of 236 $\mu g/m^3$ was measured at the Garfield site on December 29, 1986. Samples were not collected on this day at the Hayden Jail site. The second highest PM_{10} concentration for both sites, 160 $\mu g/m^3$ for Garfield and 99 $\mu g/m^3$ for the Hayden Jail, were measured on December 1, 1986. The third

highest PM_{10} concentration at the Garfield site of 147 $\mu g/m^3$ occurred on December 4, 1986, which was the same day as the highest Hayden Jail reading of 127 $\mu g/m^3$. High measured concentrations at the Hayden Jail site were consistently lower than at the Garfield site.

The overall average PM_{10} value at the Hayden Jail site of 47 $\mu g/m^3$ was also substantially lower than the 73 $\mu g/m^3$ measured at the Garfield site. The average fine particle mass was nearly the same at both sites, 12 $\mu g/m^3$ at the Hayden Jail site and 13 $\mu g/m^3$ at the Garfield site.

The days selected for chemical analysis consisted of about half of the days sampled. The analysis days were selected to represent high PM_{10} days as indicated by the selection criteria (Section 2.2.2) and a comparison of the average mass values listed in Table 3.1 for sampled and selected days.

The fine to coarse ratios were generally substantially less than 1.0 indicating a preponderance of coarse particles. These ratios were lowest on the high wind speed days and days with highest PM_{10} values, indicating an increased coarse particle mass percentage, while the highest fine to coarse particle ratios were on the lowest wind speed days, indicating a higher proportion of the mass as small particles.

3.1.2 Ambient Particulate Chemistry

The average fine and coarse particle elemental compositions are listed in Table 3.2 and 3.3. The most abundant element in both size fractions was ~~silica~~ silicon (Si), which represented about 20 percent of the mass. The most abundant coarse particle element at the Hayden Jail site was clacium (Ca) followed by iron (Fe) and aluminum (Al), while iron (Fe) and aluminum (Al) were the second and third most abundant elements at the Garfield site. Sulfur was the second most abundant fine particle at both sites followed by aluminum (Al).

Most of the ~~silica~~ silicon (Si) was in the coarse particle size fraction, with average fine to coarse particle ratios of 0.26 at the Hayden Jail and 0.14 at the Garfield site. Other elements mostly in the coarse fraction included aluminum (Al), potassium (K), calcium (Ca), titanium (Ti), manganese (Mn), iron (Fe), and copper (Cu). On the other hand, sulfur (S), chlorine (Cl), zinc (Zn), arsenic (As), cadmium (Cd), antimony (Sb), and lead (Pb) were more abundant in the fine particle size fraction.

The concentration of each of the toxic elements of arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb) were below 1.0 $\mu g/m^3$; average copper (Cu) concentrations were just above 1 $\mu g/m^3$. The lead (Pb) concentration is less than that observed in many urban airsheds because of the large contribution from motor vehicle tailpipe emissions in urban airsheds. The arsenic (As), cadmium (Cd), copper (Cu) and nickel (Ni) are substantially higher than those typically found in urban airsheds.

TABLE 3.1

COMPARISON OF MEAN SUSPENDED PARTICULATE MASS
AT HAYDEN SAMPLING SITES

Site No.	Description	Fine	Coarse	PM10	F/C Ratio*
1	Hayden Jail	12 ± 6	35 ± 22	47 ± 28	0.43 ± 0.26
	Range (n=30)	5.8 - 32	6.2 - 95	12.0 - 127	0.18 ± 0.7
2	Garfield	13 ± 5	60 ± 46	73 ± 49	0.35 ± 0.79
	Range (n=24)	6.8 - 28.0	4.4 - 221	11.6 - 236	0.05 ± 1.61
Days Selected					
1	Hayden Jail (n=12)	14.6	44.9	59.5	0.32
2	Garfield (n=13)	15.0	89.6	104.5	0.17

*Average fine to coarse ratio

TABLE 3.2

AVERAGE FINE PARTICLE ELEMENTAL COMPOSITION

Species	ug/m³		Percent	
	Hayden Jail	Garfield	Hayden Jail	Garfield
Al	0.4858 ± 0.5228	0.5498 ± 0.4604	3.335 ± 3.576	3.667 ± 3.050
Si	2.5157 ± 2.4963	2.8617 ± 2.6311	17.273 ±17.059	19.086 ±17.452
P	0.0119 ± 0.0184	0.0084 ± 0.0137	0.082 ± 0.126	0.056 ± 0.091
S	1.1033 ± 0.4546	1.1017 ± 0.4476	7.575 ± 3.036	7.348 ± 2.901
Cl	0.0238 ± 0.0177	0.0507 ± 0.1001	0.163 ± 0.120	0.338 ± 0.667
K	0.2325 ± 0.1823	0.2636 ± 0.2064	1.596 ± 1.242	1.758 ± 1.366
Ca	0.3538 ± 0.2983	0.2111 ± 0.1757	2.429 ± 2.035	1.408 ± 1.164
Ti	0.0454 ± 0.0547	0.0468 ± 0.0507	0.312 ± 0.375	0.312 ± 0.337
V	0.0013 ± 0.0019	0.0021 ± 0.0024	0.009 ± 0.013	0.014 ± 0.016
Cr	0.0009 ± 0.0012	0.0008 ± 0.0011	0.006 ± 0.008	0.006 ± 0.007
Mn	0.0087 ± 0.0169	0.0116 ± 0.0202	0.060 ± 0.116	0.077 ± 0.135
Fe	0.3728 ± 0.3791	0.3865 ± 0.3716	2.560 ± 2.592	2.578 ± 2.466
Ni	0.0013 ± 0.0014	0.0015 ± 0.0015	0.009 ± 0.010	0.010 ± 0.010
Cu	0.2237 ± 0.1588	0.1679 ± 0.0923	1.536 ± 1.080	1.120 ± 0.606
Zn	0.0800 ± 0.0765	0.0748 ± 0.0432	0.549 ± 0.523	0.499 ± 0.284
Ga	0.0006 ± 0.0007	0.0006 ± 0.0005	0.004 ± 0.005	0.004 ± 0.003
As	0.0791 ± 0.0801	0.0963 ± 0.0998	0.543 ± 0.547	0.643 ± 0.663
Se	0.0113 ± 0.0061	0.0127 ± 0.0098	0.078 ± 0.041	0.084 ± 0.065
Br	0.0039 ± 0.0018	0.0034 ± 0.0022	0.026 ± 0.012	0.023 ± 0.015
Rb	0.0004 ± 0.0008	0.0003 ± 0.0008	0.003 ± 0.005	0.002 ± 0.005
Sr	0.0012 ± 0.0013	0.0010 ± 0.0012	0.008 ± 0.009	0.007 ± 0.008
Y	0.0000 ± 0.0003	0.0001 ± 0.0003	0.000 ± 0.002	0.001 ± 0.002
Zr	0.0000 ± 0.0010	0.0000 ± 0.0009	0.000 ± 0.007	0.000 ± 0.006
Mo	0.0013 ± 0.0039	0.0015 ± 0.0035	0.009 ± 0.026	0.010 ± 0.023
Pd	0.0000 ± 0.0006	0.0000 ± 0.0005	0.000 ± 0.004	0.000 ± 0.004
Ag	0.0000 ± 0.0008	0.0000 ± 0.0007	0.000 ± 0.006	0.000 ± 0.005
Cd	0.0054 ± 0.0067	0.0052 ± 0.0069	0.037 ± 0.046	0.034 ± 0.046
In	0.0000 ± 0.0013	0.0000 ± 0.0011	0.000 ± 0.009	0.000 ± 0.008
Sn	0.0000 ± 0.0016	0.0000 ± 0.0014	0.000 ± 0.011	0.000 ± 0.009
Sb	0.0038 ± 0.0132	0.0017 ± 0.0062	0.026 ± 0.090	0.011 ± 0.041
Ba	0.0000 ± 0.0064	0.0000 ± 0.0056	0.000 ± 0.044	0.000 ± 0.037
La	0.0000 ± 0.0118	0.0000 ± 0.0102	0.000 ± 0.081	0.000 ± 0.068
Hg	0.0004 ± 0.0004	0.0004 ± 0.0004	0.002 ± 0.003	0.003 ± 0.003
Pb	0.1664 ± 0.1152	0.1737 ± 0.0834	1.143 ± 0.783	1.159 ± 0.545

TABLE 3.3

AVERAGE COARSE PARTICLE ELEMENTAL COMPOSITION

Species	$\mu g/m^3$		Percent	
	Hayden Jail	Garfield	Hayden Jail	Garfield
Al	2.1035 ± 1.3704	4.6364 ± 2.2458	4.685 ± 3.017	5.182 ± 2.456
Si	9.7309 ± 2.1813	20.7171 ± 2.5052	21.674 ± 4.353	23.156 ± 1.579
P	0.0276 ± 0.0585	0.0308 ± 0.0443	0.062 ± 0.130	0.034 ± 0.049
S	0.8378 ± 0.4305	1.0524 ± 0.4497	1.866 ± 0.941	1.176 ± 0.489
Cl	0.0255 ± 0.0198	0.0216 ± 0.0296	0.057 ± 0.044	0.024 ± 0.033
K	0.8308 ± 0.5338	2.6364 ± 1.6353	1.850 ± 1.175	2.947 ± 1.804
Ca	3.6350 ± 2.8756	2.0362 ± 1.3292	8.096 ± 6.354	2.276 ± 1.468
Ti	0.2373 ± 0.2005	0.6505 ± 0.5663	0.529 ± 0.444	0.727 ± 0.629
V	0.0126 ± 0.0082	0.0280 ± 0.0237	0.028 ± 0.018	0.031 ± 0.026
Cr	0.0000 ± 0.0003	0.0000 ± 0.0005	0.000 ± 0.001	0.000 ± 0.001
Mn	0.0471 ± 0.0413	0.1042 ± 0.0971	0.105 ± 0.091	0.116 ± 0.108
Fe	2.2803 ± 1.5360	4.9837 ± 4.0328	5.079 ± 3.384	5.570 ± 4.473
Ni	0.0015 ± 0.0017	0.0036 ± 0.0028	0.003 ± 0.004	0.004 ± 0.003
Cu	0.9055 ± 0.6046	1.0881 ± 0.5799	2.017 ± 1.332	1.216 ± 0.637
Zn	0.0384 ± 0.0271	0.0615 ± 0.0363	0.086 ± 0.060	0.069 ± 0.040
Ga	0.0003 ± 0.0008	0.0005 ± 0.0016	0.001 ± 0.002	0.001 ± 0.002
As	0.0148 ± 0.0127	0.0221 ± 0.0215	0.033 ± 0.028	0.025 ± 0.024
Se	0.0007 ± 0.0011	0.0013 ± 0.0015	0.002 ± 0.002	0.001 ± 0.002
Br	0.0008 ± 0.0016	0.0003 ± 0.0007	0.002 ± 0.004	0.000 ± 0.001
Rb	0.0039 ± 0.0036	0.0138 ± 0.0108	0.009 ± 0.008	0.015 ± 0.012
Sr	0.0142 ± 0.0096	0.0200 ± 0.0113	0.032 ± 0.021	0.022 ± 0.012
Y	0.0003 ± 0.0005	0.0033 ± 0.0037	0.001 ± 0.001	0.004 ± 0.004
Zr	0.0000 ± 0.0010	0.0007 ± 0.0019	0.000 ± 0.002	0.001 ± 0.002
Mo	0.0142 ± 0.0115	0.0297 ± 0.0170	0.032 ± 0.025	0.033 ± 0.019
Pd	0.0000 ± 0.0005	0.0000 ± 0.0006	0.000 ± 0.001	0.000 ± 0.001
Ag	0.0000 ± 0.0007	0.0000 ± 0.0007	0.000 ± 0.002	0.000 ± 0.001
Cd	0.0000 ± 0.0009	0.0000 ± 0.0010	0.000 ± 0.002	0.000 ± 0.001
In	0.0000 ± 0.0011	0.0000 ± 0.0012	0.000 ± 0.002	0.000 ± 0.001
Sn	0.0000 ± 0.0014	0.0000 ± 0.0014	0.000 ± 0.003	0.000 ± 0.002
Sb	0.0000 ± 0.0029	0.0000 ± 0.0031	0.000 ± 0.007	0.000 ± 0.003
Ba	0.0000 ± 0.0055	0.0118 ± 0.0298	0.000 ± 0.012	0.013 ± 0.033
La	0.0000 ± 0.0099	0.0066 ± 0.0237	0.000 ± 0.022	0.007 ± 0.026
Hg	0.0000 ± 0.0002	0.0004 ± 0.0009	0.000 ± 0.000	0.000 ± 0.001
Pb	0.0342 ± 0.0191	0.0453 ± 0.0234	0.076 ± 0.042	0.051 ± 0.026

3.1.3 Elemental Composition of Source Profiles

The potential major sources of PM_{10} in Hayden were grouped into the following eight general source categories:

- Fugitive area dust sources from wind and traffic
- Ore handling and processing
- Fugitive emissions from the smelting process
- Miscellaneous smelter dust
- Wind-blown dust from ore tailings ponds
- Stack emissions from the smelting process
- Motor vehicle emissions
- Background

Representative source profiles were developed through direct source sampling for the first five categories. Literature composition source profiles were used to represent motor vehicle emissions as well as other miscellaneous sources. Source profiles were not developed to represent emissions from the main stack, acid plant, and bell damper because these sources have been estimated to have minimal impacts within the study area. The background aerosol was not characterized.

The NEA Report attached as Appendix A contains tables listing the source codes, the source composition profiles for the key sources, and the fine to coarse particle ratios for each source type. The tables show that crustal sources are primarily large particles high in aluminum (Al), ~~silica~~ silicon (Si), calcium (Ca) and iron (Fe); plant road dust shows reduced calcium (Ca) with high copper and sulfur. Pyrometallurgical smelter fugitives were generally fine particulates characterized by concentrations of zinc (Zn), arsenic (As), cadmium (Cd), antimony (Sb), and lead (Pb). Subtleties in the relative concentrations of these elements distinguished the various sources within the smelter. The tables and text describing source characteristics are contained in the NEA report.

3.1.4 Source Impacts

Chemical mass balance source apportionment calculations were performed on 50 fine and coarse particulate filters, representing about one-half of the sampling days in this study. Individual source apportionment results for each filter are presented in the NEA Report. Table 3.4 shows an example of the CMB results. In this example, the filter identification numbers for the matching fine and coarse particle filters (715, 714), particle size (coarse), sampling site (Hayden Jail, HD), and sampling date (January 4, 1987) are listed at the top of the page. The CMB modeling performance measures are listed just below this information (R-SQUARE: .9749, CHI SQUARE: 1.3403) followed by a listing of the fitted sources and their source contributions. In the bottom portion of the table are listed the measured elemental concentrations, their calculated concentrations, and the ratio of the calculated to measured concentrations. Elements actually used in the fitting process are indicated with asterisks.

TABLE 3.4

Sample Source Apportionment Results
Hayden Jail
Coarse Fraction
January 4, 1987

RESULTS FOR CMB SITE: MD 715 714 YEAR: 87 DATE: 0104
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9749
CHI SQUARE: 1.3403
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.945+-	.481	5.651+-	1.509
13	KNECT	8.833+-	2.067	25.658+-	6.538
16	SSFF1	.000+-	.000	.000+-	.000
19	SSFF2	.176+-	.032	.510+-	.106
22	2NCD3	.000+-	.000	.000+-	.000
28	DUSTD	22.818+-	2.034	66.280+-	8.917
	TOTAL:	33.772+-	1.855	98.098+-	11.260

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			34.42620+-	3.46960	100.00000+-	14.25297	33.77156+-	1.85531	.98+-	.11	TOTAL
13	AL		*	1.88920+-	.23980	5.48768+-	.88943	1.98253+-	.16024	1.05+-	.16	AL
14	SI		*	9.02600+-	1.01600	26.21840+-	3.96132	7.27240+-	.60461	.81+-	.11	SI
15	P			<	.00000	<	.03340	.00487+-	.00578	.00+-	.00	P
16	S		*	.63590+-	.07620	1.84714+-	.28922	.61063+-	.04299	.96+-	.13	S
17	CL			.02030+-	.00680	.05897+-	.02063	.01752+-	.00308	.86+-	.33	CL
19	K		*	.78350+-	.08570	2.27588+-	.34496	.88214+-	.08102	1.13+-	.16	K
20	CA		*	1.72870+-	.19420	5.02147+-	.75785	1.87016+-	.12443	1.08+-	.14	CA
22	TI		*	.17810+-	.04050	.51734+-	.12868	.25115+-	.02292	1.41+-	.35	TI
23	V			<	.00890	<	.02656	.00505+-	.00194	.57+-	.62	V
24	CR			<	.00000	<	.00203	.00245+-	.00047	.00+-	.00	CR
25	MN		*	.03080+-	.00360	.08947+-	.01381	.02618+-	.00204	.85+-	.12	MN
26	FE		*	1.67230+-	.18880	4.87507+-	.73632	1.59822+-	.13348	.95+-	.13	FE
28	NI			<	.00020	<	.00145	.00320+-	.00246	16.01+-	41.86	NI
29	CU			.68500+-	.07750	1.98976+-	.30149	.26821+-	.01978	.39+-	.05	CU
30	ZN		*	.03000+-	.00540	.08714+-	.01798	.02874+-	.00361	.96+-	.21	ZN
31	GA			<	.00000	<	.00116	.00026+-	.00033	.00+-	.00	GA
33	AS		*	.00960+-	.00350	.02789+-	.01055	.01674+-	.00374	1.74+-	.75	AS
34	SE			.00070+-	.00030	.00203+-	.00090	.00011+-	.00046	.15+-	.66	SE
35	BR		*	.00150+-	.00040	.00436+-	.00124	.00077+-	.00320	.52+-	2.14	BR
37	RB			.00300+-	.00060	.00871+-	.00195	.00497+-	.00044	1.66+-	.36	RB
38	SR			.00790+-	.00100	.02295+-	.00371	.00765+-	.00056	.97+-	.14	SR
39	Y			.00160+-	.00160	.00465+-	.00467	.00165+-	.00033	1.03+-	1.05	Y
40	ZR			<	.00000	<	.00930	.00069+-	.00110	.00+-	.00	ZR
42	MO			.01110+-	.00200	.03224+-	.00666	.00698+-	.00081	.63+-	.13	MO
46	PD			<	.00000	<	.00465	.00000+-	.00063	.00+-	.00	PD
47	AG			<	.00000	<	.00668	.00000+-	.00084	.00+-	.00	AG
48	CD			<	.00000	<	.00842	.00080+-	.00113	.00+-	.00	CD
49	IN			<	.00000	<	.01075	.00089+-	.00134	.00+-	.00	IN
50	SN			<	.00000	<	.01249	.00147+-	.00154	.00+-	.00	SN
51	SB			<	.00000	<	.02643	.00350+-	.00355	.00+-	.00	SB
56	BA			<	.00000	<	.05054	.00000+-	.00667	.00+-	.00	BA
57	LA			<	.00000	<	.09266	.00619+-	.01143	.00+-	.00	LA
80	HG			<	.00000	<	.00087	.00004+-	.00031	.00+-	.00	HG
82	PB		*	.02610+-	.00410	.07581+-	.01415	.02014+-	.00287	.77+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.6+- 1.4 COARSE: 34.4+- 3.5 TOTAL: 48.0+- 3.8

The CMB results presented in Appendix B represent the best model solution as determined by an iterative procedure which optimizes the following model performance parameters:

- Source contributions should be positive and greater than their uncertainties. The t-statistic (TSTAT) value should be greater than 2.0.

- R-square values should be greater than 0.8.

- Reduced chi square should be minimized and generally less than 2. A value greater than 4 indicates that the model has not explained the ambient data well.

- The calculated to measured concentration ratio for individual elements should approach 1.0 within the listed uncertainty.

- The percent elemental mass explained should approach 100 percent within the uncertainty.

- The degrees of freedom (DF) should be maximum, preferably greater than 5.

- Source contribution estimates should approximate the measured mass concentrations.

In the example illustrated in Table 3.4, 98.098 $\pm$ 11.260 percent of the mass was explained by the sources indicated. A reduced chi square value of 1.3403 was obtained with 8 degrees of freedom (DF). The calculated to measured elemental ratios were generally equal to 1.0 within their listed uncertainties for the fitting elements. The largest deviations from 1.0 were for elements below the analytical detection limit and for abundant elements like Cu which were omitted from the fitting because of the lack of a source capable of explaining the excess copper as discussed in the next section. The R-square value is 0.9749, and the mean t-statistics value is 4.98 with a low value of 3.74.

Ore dust from the ore crusher, conveyor belt, etc., was the largest source of coarse and PM_{10} suspended particulate mass at both the Hayden Jail and Garfield monitoring sites. Kennecott road dust contributed almost as much PM_{10} and coarse particulate mass at the Hayden Jail as ore dust, but over ten times less than the ore dust source at the Garfield site. The only other sources contributing more than 1 percent of the suspended particulate PM_{10} mass were sources of secondary sulfate and the copper ore tailings pile, both of which contributed about 5 percent of the particulate mass.

On days when there were high winds from the east (Regime 1), ore dust (DUSTO and CUOR) was the dominant source of PM_{10} mass at both sites and responsible for about 70 percent of the mass with about 25 percent of the mass unexplained. On low wind speed days when the wind was from the south (Regime 2), ore dust was still

the largest source of PM_{10} mass at the Garfield site, but Kennecott road was the largest source at the Hayden Jail site. On days with moderate wind speeds from the southeast (Regime 3), ore dust was the largest source of PM_{10} mass at both sites as it was on Regime 1 days, but on Regime 3 days, with moderate wind speeds, Kennecott Road contributed almost as much mass as the ore dust source category. On the one day that represented Regime 4 when the wind was from the west at moderate wind speeds, the major source impacts at the Hayden Jail was Kennecott road dust which was responsible for 50 percent of the PM_{10} mass, four times more than the impact from ore dust. Under this meteorological regime, calcium rich sources, such as lime and gypsum were responsible for over 15 percent of the PM_{10} mass at the Hayden Jail site, but only 2 percent of the mass at the Garfield site.

Secondary sulfate contributed about 3 or 4 $\mu g/m^3$ to PM_{10} particulate mass and was relatively independent of meteorological regime suggesting a regional background source of this species or else a high concentration in surrounding crustal material due to deposition.

3.2 CMB Model Validation

Chemical mass balance (CMB) receptor model calculations are performed on individual filter data sets. These calculations yield the most probable source contributions based on ambient and source aerosol chemistry. Because these calculations are generally made independently of meteorological characteristics, plant operating schedules, etc., the validity of the CMB results can be evaluated by comparing them with these independent airshed and source characteristics.

The objective of this section is to evaluate the source apportionment results relative to the complete airshed data base and model evaluation statistics. It is clear from the results that not all of the source profiles have been characterized nor have the source profile uncertainties been adequately defined by replicate source sampling over an extended period of time. The impact these limitations have on the source contribution results are discussed in the following subsections.

3.2.1 Quality of CMB Results

The quality of each CMB source apportionment calculation is evaluated on the basis of the percent of total mass explained, R-square, chi square, t-statistic, source uncertainty clusters, elemental ratios, and residuals. Results of the CMB statistical analysis are presented in the NEA Report.

The total deposit mass was reasonably well explained considering that secondary sources of carbon and nitrate were not included. In addition, a source rich in copper has clearly been omitted. The average unexplained coarse particle mass was only 1 percent at the Hayden Jail site, but was up to 10 percent at the Garfield site. The unexplained fine particle mass at both sites averaged about 20 percent. However, the average R-square value was 0.97 and the lowest value was 0.82, indicating generally good fits with the fitting species used. The reduced chi square values are relatively high averaging 3.8 for fine particles at the Hayden Jail and 3.6 at the Garfield site, and 2.1 and 2.9, respectively, for coarse particles. These high chi square values are due primarily to the use of source profile uncertainties that do not reflect the true source profile variability as a function of time or space and/or the omission of one or more sources.

The source profile uncertainty used was the larger of the standard deviation of the replicate values, the analytical uncertainty, or 10 percent. The uncertainties for the major elements in the two largest source categories (Kennecott Road and ore dust), however, were only 10 percent and represented essentially only one sample. Most of the t-statistic values were greater than 2 and generally 4 or greater.

The elemental ratios and residuals for the fitting elements were, for the most part, in the acceptable range, but there were some elements that consistently exhibited poor fits. Most notable

was copper, which was removed as a fitting element at the beginning. Other elements which were well above their detection limits but frequently underexplained (low ratios, high negative residual) included ~~silica~~ silicon (Si), potassium (K), manganese (Mn), and iron (Fe).

In general, the best quality fits were obtained from filters with deposits collected when wind speeds were low to moderate and from the south or southeast. This group of thirty-six filters represents almost three fourths of the filters analyzed. The average coarse particle mass explained was 100 ± 2 percent, and the average fine particle mass explained was 84 percent. The poorest quality fits were obtained for filters exposed during high wind speeds from the east (Regime 1).

Although the quality of the CMB modeling calculations could be improved, primarily through more complete source characterization, the major source contributions are not expected to be significantly different except for the source responsible for the excess copper (Cu) and other underexplained species.

Qualitative conclusions, as described in the preceding paragraphs, were made by EPA's contractor, Engineering Science, without input from ADEQ.

3.2.2 Meteorological and Site Dependence of Source Contributions

The meteorological and site dependence of the calculated source impacts were consistent with the known source-receptor relationships. For example, the average ore dust source (copper ore unloading, crushing, and conveying) contribution to PM_{10} was about three times greater at the Garfield site than at the Hayden Jail as expected from the close proximity of the Garfield site to this source. On the other hand, the average contribution of dust from Kennecott Road that runs behind the west side of the Jail was about four times greater at the Jail than at the Garfield site. In addition, when strong winds were out of the east, the Kennecott Road dust contributions were minimal or below detection limits, and the ore dust contributions were high at both sites. The highest ore dust contributions to the coarse particle fraction at Garfield occurred during regimes when the wind was from the east or southeast. Contributions during the east and southeast regimes were more than double the average contributions during the other two wind regimes.

The source contributions from calcium (Ca) rich sources such as lime or gypsum were also significantly higher at the Hayden Jail as expected from the location of an old lime/gypsum facility in the vicinity of the Jail.

Copper ore tailings dust impacted the sites only twice and both times the impacts were at the Garfield site. One of the days was a day when the Hayden Jail sampler was not operating.

The impact of fine particle such as secondary sulfate, transportation emissions, and the smelter fugitive process emissions were quite similar at both sites.

3.2.3 Particle Size Dependence

The particle size dependence of the source contributions was consistent with the source emissions characteristics. For example, about 90 percent of the ore, road and tailings dust was apportioned in the coarse particle fraction, and about 95 percent of the secondary sulfate was apportioned to the fine particle fraction. This latter point is significant since the average fine to coarse S ratio was about 1.2, and much of the coarse particle S was associated with ore dust.

The average transportation (exhaust) impact was small (about 0.2 $\mu g/m^3$) and resolved only in the fine particle fraction.

The contributions from the smelter's process fugitive emissions (slag skimming, matte tap, converter and slag pour) were generally quite small (about 0.8 $\mu g/m^3$). Although only 75 percent of these source impacts were in the fine particle size fraction, 90 percent to 95 percent of the source emissions were in the fine fractions suggesting the possible over-estimating of the coarse particle contribution from these source categories.

It should also be noted that the ore dust profile was developed from settled dust collected in the ore crusher building. Thus, the observed low F/C ratio for this source may be perturbed by the enrichment of coarse particles in the settling process.

3.2.4 Source Variability

During a twelve hour period in December and January, when the smelter's furnace operations were shut down, process fugitive emissions associated with the slag-skimming, matte tapping, and converter contributed only 0.31 and 0.42 $\mu g/m^3$ to PM10 on the 9th and 7th respectively, about half of the study average of 0.8.

The days with high fine to coarse ratios were characterized by lower than normal contributions from coarse particle sources rather than increased impacts from fine particle sources, which were relatively small contributors and reasonably constant throughout the study period.

The CMB model results on the three days that overlapped the days when source samples were collected were among the highest quality. The average R-square value was 0.97 ± 0.01, and the average chi square value was 2.1 ± 0.7. The average fine particle chi square value was 1.7, while the coarse particle chi square value was 2.5. The percent coarse particle mass explained was 100 percent, and the fine particle mass explained was 83 percent.

Source profiles for the fugitive process emissions are based on samples collected on these three days. The significance of this close overlap of ambient and source sampling is most clearly reflected in the excellent quality of the fine particle fits and ratios close to 1.0 for the elements most abundant in the fine particle fugitive dust emissions such as zinc (Zn), arsenic (As), and lead (Pb).

The poorer quality of fit obtained for the coarse particle fraction on these three days is quite likely due to the contribution of other dust sources either not sampled or included in a composite, or variability in the ore dust emissions from the crusher and/or the conveyor belt. Although a variety of smelter yard dust and enriched ore samples were collected during the last week in January, many of the samples were combined into one composite. In addition, even though samples of dust in the ore crusher building were collected, filter samples collected in the building were invalidated because of material loss in shipment. The bulk dust collected from within the building and later resuspended in the laboratory represented the accumulation of dust over an extended period of time and was not necessarily representative of the emissions on these three days.

Poor fitting of copper (Cu) in many airsheds is not considered significant because of the potential contribution from the sampler pump motors. The problem is probably more common in urban airsheds, however, because of the large number of potential electrical sources of copper (Cu). In this particular case, the excess copper (Cu) is not thought to be due to either of the above sources because of the low population density and good ventilation at the sampling sites. Therefore, it is believed that excess copper (Cu) is due to a local source not identified by Engineering Science.

3.2.5 Major Source Impacts

- Ore Dust

Ore dust (copper ore unloading, crushing, and conveying) was the largest contributor to fine, coarse and PM_{10} particles at both sites. The fine to coarse source contribution ratios were typical of the low fine to coarse particle ratio observed with the source. The impacts calculated for this source are consistent with the spatial relationship of the two receptors relative to the source and the impacts during the five specified meteorological regimes. The major cause of uncertainty in this source contribution estimate is due to the potential variability in the source profile for this source. The lack of replicate samples to establish this variability further exacerbates this problem.

- Road Dust

The second largest contributor of PM_{10} and coarse particles was road dust. This source impact, like the ore dust source category, was consistent with particle size, source

receptor, and meteorological regime stratification relationships. Similarly, the largest source of error in this source contribution estimate is due to the limited definition of the variability of the emission along any given road, as well as the potential influence of a separate source of PM_{10} with similar chemical composition.

- Secondary Sulfate

The secondary sulfate source contribution estimate is based on the assumption that any S not explained by primary sources is secondary sulfate. Even though the fine and coarse particle S ratio was close to 1.0, the apportioned secondary sulfate was highly concentrated in the fine particle fraction as would be expected by the nature of this source. In addition, the impact from this source was relatively constant and independent of meteorological regime and receptor location which suggests a source related to the background air mass or else a high concentration in surrounding crusted material due to deposition.

- Ore Tailings

The copper ore tailing impacts were observed only on the highest wind speed days when gusts approached 24 mph which is consistent with the origin of this dust. This source impact was observed above its detection limit only in the coarse particle fraction and not at the Hayden Jail site.

- Lime and Gypsum

The lime and gypsum source contribution estimates were also largely coarse particle impacts. Lime and/or gypsum either is currently being used at the smelter or was in the past. An old lime or gypsum plant or storage area can be seen from the Hayden Jail. The impact was largest at the Jail. It is also likely that some of the material from the old facility on the hill above the Jail has washed down the gully passing behind the Jail enriching the general area with calcium. A possible but unlikely source of gypsum was a truck dump and rail car loading area just south of Winkleman.

- Process Fugitive Emissions

This category includes process fugitive emissions form slag skimming, matte tapping, converter operations, and slag pouring. The relative impacts from these sources may vary substantially over a twenty four hour period, but the individual source impacts can be determined when the impacts are substantially above their detection limits. In this particular study, the impacts were reasonably small and represent only 1-2 percent of the PM_{10} mass. This source category, however, was responsible for 80 to 100 percent of the lead (Pb) mass and the toxic species of arsenic (As) and cadmium (Cd). Although most of the impact from this source category was attributed to the fine particle fraction, the fine to coarse particle source impact

ratios were higher than expected from the source profile characteristics. This is thought to be due in part to the poor source signal to noise ratio in the coarse particle size fraction and the potential omission or mis-characterization of a coarse particle source not identified by Engineering Science. As a result, it is likely that the coarse particle source contribution estimates for this source category are overstated.

- Smelter Yard Dust

This source category, which is also called composite plant road dust (PLNTRD or COMPR), is a mixture of five dust samples collected within the smelter. This composite sample has the highest concentration of copper (Cu) and it is assumed that some of the individual dust samples included in this composite source category have even higher copper (Cu) concentrations. It is considered likely that one or more of the dust sources included in this composite are responsible for more of the fugitive yard dust coming from the smelter than others included in the composite. These possible dust sources would have higher copper (Cu) concentrations than reported for the composite and are possibly enriched in species such as iron (Fe) and manganese (Mn). This assumption is consistent with the impacts and chemistry on meteorologically regime-stratified days.

- Sources Not Included

Several sources of emissions from the smelter were not characterized or included in the CMB model calculations. These sources included the main stack, acid plant stack, copper anode blowing, bell caps, and copper pouring. The impacts on local receptors from all of these sources were considered to be small or at least less than the process fugitive emissions measured. Consistent with this assumption is the relatively low impact from the sum of the main process fugitive emissions sources sampled and the reasonably good fits obtained for most of the fine particle filters. In addition, the low fine to coarse particle ration for such elements as copper (Cu) suggests that the copper anode blowing and pouring, which are expected to emit primarily fine copper (Cu) particles, are relatively unimportant.

3.2.6 Large Chi Square Values and Unexplained Mass

It was not possible to obtain reduced chi square values close to 2.0 for several of the data sets. The worst case was for the fine particle sample collected on November 22, 1986, at the Hayden Jail where the lowest reduced chi square value that could be obtained was 10.7. The element primarily responsible for the high chi square value is potassium (K). The source profile library does not show a source rich in potassium (K). The only way the chi square value can be reduced is to eliminate potassium (K) from the fitting. This may be a case where one of the smelter emissions mentioned above that were not characterized was making a substantial contribution to the fine particle fraction even though the average wind direction was from the west. Silicon, in

addition to potassium (K), also portrayed a poor fit in the fine fraction on this day at the Garfield site. See Table 6.2. In contrast, the chi square values for the corresponding coarse fraction were 2.4 at the Jail, 1.1 at Garfield. In addition, the elemental ratios for K and Si were close to 1.0 in the coarse fraction.

In this particular example, it is likely that either an uncharacterized smelter source emission impacted the fine particle filter, a source such as the mine west of the smelter impacted the site, or one of the fine particle source profiles was substantially altered. This was the only day analyzed in which the average wind direction was from the west (261°).

It is likely that similar variations in the source profiles and/or source impacts are responsible for the other samples for which high reduced chi square values were obtained.

- Unexplained Mass and Elemental Concentrations

Unexplained mass was largest for the fine particle fraction which is typical of most airsheds. In this study, most of the unexplained fine particle mass is thought to be associated with secondary organic carbon and nitrate, as well as water and sources rich in carbon but not resolved. In some cases, some of the unexplained mass was probably associated with the impact from uncharacterized sources. In the coarse particle size fraction, the unexplained mass was likely due to the omission of a smelter yard dust source.

4.0 RECONCILIATION OF RECEPTOR/DISPERSION MODEL RESULTS

The development of control strategies needed to attain/maintain the PM10 standards depends on the ability of available modeling techniques to properly predict the contributions from each source at selected model receptors. The PM10 SIP Development Guideline recommends that both Chemical Mass Balance (CMB) and Dispersion Models (DM) be used to complete the source apportionment. Because these techniques use different inputs and calculation techniques, the resulting predicted PM_{10} concentrations cannot be expected to show perfect agreement. The differences may be negligible, but on occasions they may be large enough to raise questions concerning which model is correct. A systematic method for examining and reconciling the model estimates is contained in the EPA's Protocol for Reconciling Differences Among Receptor and Dispersion Models (Pace, et. al., 1986). The steps outlined in the protocol were used to reconcile the differences between the CMB and DM analyses performed for Hayden.

4.1 Preliminary Dispersion Modeling

Using the DM data base established for the study area (see Section 2.3), preliminary DM estimates were made. These estimates were then compared with the CMB results in order to determine whether all major source groups were adequately defined in the emission inventory.

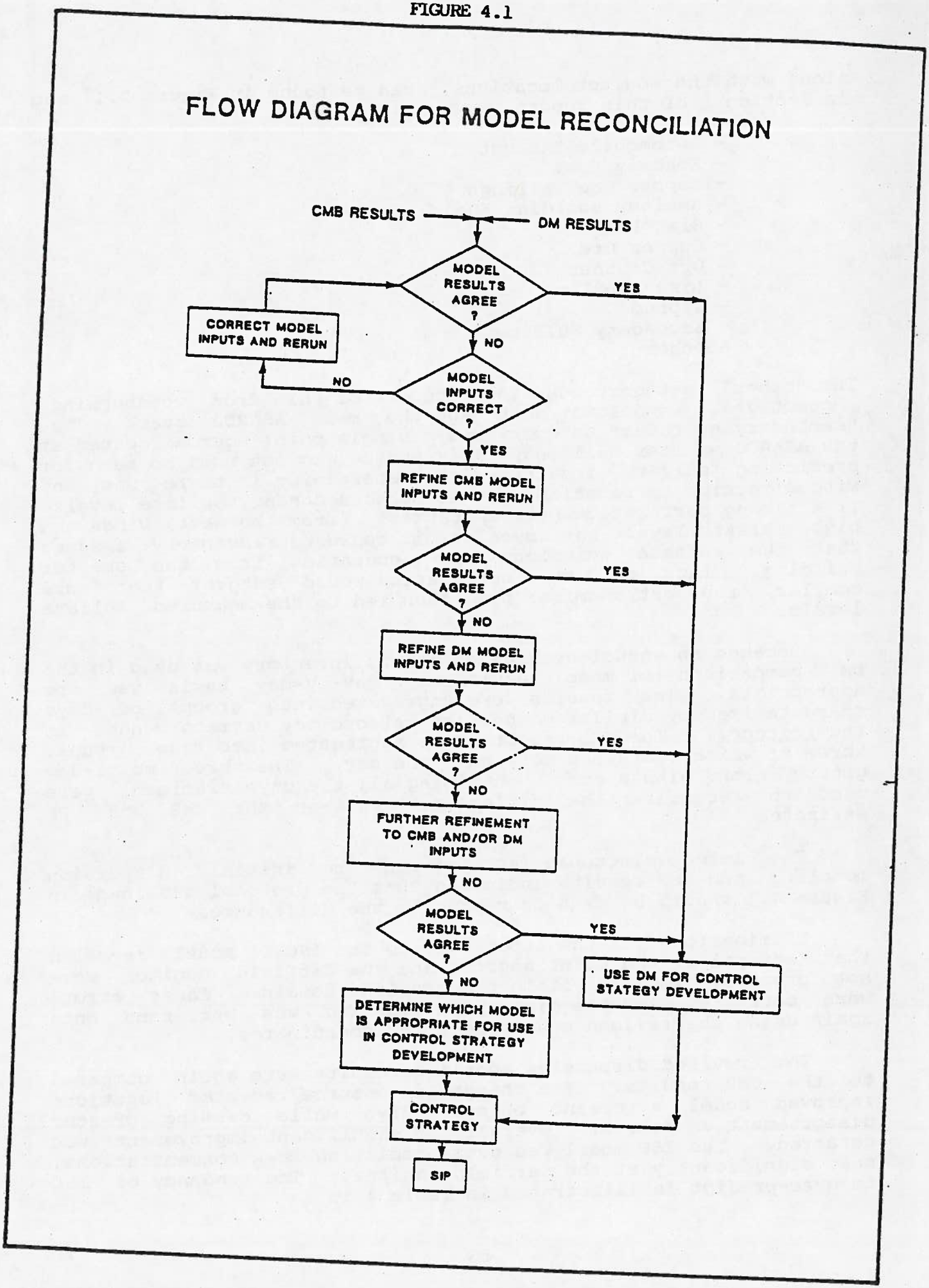
For Hayden, preliminary dispersion modeling was performed for the 15 days which were evaluated using the CMB. Site-specific meteorology for the days selected for analysis was used to predict 24-hour average PM_{10} impacts from the sources contained in the emission inventory. The dispersion modeling revealed discrepancies between the results from the CMB and DM analyses which needed to be reconciled before modeling of potential control strategies could be performed.

4.2 Model Reconciliation

The Protocol for Reconciling Differences Among Receptor and Dispersion Models (Pace, et. al., 1986) (henceforth referred to as the Protocol) provides an eight step approach which involves the comparison of model results, re-verification of model input data and the refinement of inputs to both models. The general protocol for resolving the differences between the two modeling approaches is summarized in Figure 4.1. This protocol provides the basic framework for the reconciliation of the PM10 modeling analyses for Hayden.

The PM_{10} emissions in the Hayden area were initially grouped into source categories which generally corresponded with those used in the CMB analysis. Dispersion modeling impacts from these source groups provided for a quick check against the CMB predictions. The source groups used in the initial ISCST modeling are given below. The locations of the point and area sources,

FIGURE 4.1


FLOW DIAGRAM FOR MODEL RECONCILIATION
CMB RESULTS
DM RESULTS
MODEL RESULTS AGREE ?
YES
NO
CORRECT MODEL INPUTS AND RERUN
MODEL INPUTS CORRECT ?
NO
YES
REFINE CMB MODEL INPUTS AND RERUN
MODEL RESULTS AGREE ?
YES
NO
REFINE DM MODEL INPUTS AND RERUN
MODEL RESULTS AGREE ?
YES
NO
FURTHER REFINEMENT TO CMB AND/OR DM INPUTS
NO
MODEL RESULTS AGREE ?
YES
NO
USE DM FOR CONTROL STATEGY DEVELOPMENT
DETERMINE WHICH MODEL IS APPROPRIATE FOR USE IN CONTROL STRATEGY DEVELOPMENT
CONTROL STRATEGY
SIP

along with the monitor locations, can be found in Figure 2.1 and in Section 2 of this report.

- Automobile Exhaust
- Roadway Dust
- Copper Ore Tailings
- Smelter Building Fugitives
- Slag Dump
- Copper Ore
- Ore Crusher
- Lime Handling
- Gypsum
- Secondary Sulfates
- Other

The "other" category contained sources of PM10 from woodburning, locomotives, windblown dust and the main ASARCO stack. The "secondary sulfates" category was a single point source located at the ASARCO smelter building. This source was not used so much for predicting sulfate impacts as for determining if there was any wind direction correlation with measured secondary sulfate levels. If a strong correlation between easterly (from the east) winds and high sulfate levels was revealed, it could be reasonably assumed that the sulfate emissions were emanating from the smelter building. Lack of such a correlation would suggest that more complex transport/chemical processes led to the measured sulfate levels.

Because an annual-average emissions inventory was used in the DM, comparison of model results on a day-by-day basis was not appropriate. The results were aggregated into groups of days characterized by similar dispersion meteorology as recommended in the Protocol. The CMB results were aggregated into five groups, three of which contained more than one day. The three multi-day groups, along with a group containing all the days examined, were used to reconcile the differences between the CMB and DM estimates.

The large discrepancies between the initial dispersion modeling and CMB results indicated that the protocol outlined in Figure 4.1 should be used to reconcile the differences.

Examination of the input data to the ISCST model revealed that several of the point sources and the Garfield monitor were not properly located within the modeling domain. These errors were corrected and the dispersion modeling was performed once again using the revised source/receptor coordinates.

The revised dispersion modeling results were again compared to the CMB results. The changes in source/receptor locations improved model agreement on some days while causing greater disagreement on others. Overall, no significant improvement was detected. The ISC model was over-predicting PM_{10} concentrations, most significantly at the Garfield monitor. The tendency of ISC to over-predict is illustrated in Table 4.1.

TABLE 4.1

Preliminary Modeling Results
Hayden PM_{10} Modeling - Model Reconciliation

Date: All Days

Source Group	24-hr Impact (ug/m^3) Garfield CMB	Garfield ISC	Jail CMB	Jail ISC
All Sources	104.51	398.96	59.49	85.77
Auto Exhaust	0.23	0.42	0.19	0.39
Roadway Dust	4.69	13.46	20.71	23.21
Tailings	5.29	2.35	0	1.51
Smelter Building Fug.	0.86	1.02	1.04	1.11
Slag Dump	0.06	2.17	0.03	2.87
Copper Ore	0	19.65	0	10.34
Ore Crusher	73.75	332.63	27.72	31.51
Lime Handling	0.34	1.06	0.57	1.65
Gypsum	1.63	1.88	2.94	2.39
Secondary SO_4	4.11	5.04	4.03	5.50
Other*	13.44	16.92	2.29	5.29
Total Measured	104.51		59.49	

* ISC: Woodburning, Locomotives, Windblown Dust, Stack
CMB: Unexplained

The results presented in Table 4.1 illustrate the major discrepancies between the results of the two modeling approaches. The larger ISC over-prediction at the Garfield monitor is mainly attributable to the contributions from the ore crusher and copper ore groups. The ISC results also indicate that significant PM10 contributions at both monitoring sites arise from roadway dust and sources not identified by receptor modeling techniques. The predictions from the copper ore tailings and the ASARCO slag dump also reveal disagreement. The DM results over-predict the CMB results further if background PM_{10} levels (not shown) are included. Table 4.1 also shows that, while the magnitudes do not show good agreement, both models identify roadway dust and crusher-related activities as the major source contributors to the PM10 levels at the monitoring sites.

Certain details of the model comparison, which indicated adjustments to model inputs should be made, are not shown by the 15 day composite numbers in Table 4.1. For example, the DM did not show conclusively that secondary sulfate impacts were associated from a single source at the ASARCO smelter building. As a result, the sulfates source was eliminated from further evaluation and secondary sulfates levels were assumed to be contained in the background PM_{10} concentration. The CMB results showed that impacts from the copper ore tailings were seen on only two days at the Garfield monitor. Review of the 15 days of meteorological data revealed wind speeds which were generally below the threshold needed to generate emissions from the tailings pond. This led to the elimination of the copper ore tailings sources from all days except the two days where tailings impacts were estimated by the CMB. Further examination and reconciliation of the impacts from the roadway dust, slag dump, copper ore, ore crusher and locomotive exhaust source categories was deemed necessary based on the preliminary modeling. A discussion of the refinement of the estimates from each of these categories is given below. Furthermore, an annual-average PM_{10} background concentration of 16 $\mu g/m^3$, measured at Organ Pipe National Monument in southcentral Arizona, was used in subsequent dispersion modeling.

The <u>Protocol</u> recommends that the reconciliation process begin with refinements to the CMB analysis. The CMB results showed a generally good characterization of the major PM_{10} contributors in Hayden (see Section 3). Conversely, the emissions estimates used in the initial dispersion modeling contained a high degree of uncertainty which are embodied in the associated DM concentration estimates. Therefore, it was determined that reconciliation of the model estimates would be accomplished through the refinement of DM emission inputs and that no refinement of the CMB results was necessary. Clarification of the quality of source samples used to characterize a source or source group as well as CMB predictions provided the basis for the refinement of the emission estimates used in the dispersion modeling.

The <u>Protocol</u> states that acceptable model agreement is achieved when the CMB and DM results agree within one standard

error. Because the results from both modeling techniques have an associated uncertainty, acceptable model agreement would occur when the ranges of the predicted concentrations (defined by the calculated impact and the standard error) overlap. For example, a CMB-predicted concentration of 100 ± 5 $\mu g/m^3$ and a DM-predicted concentration of 120 ± 36 $\mu g/m^3$ would show acceptable agreement because the CMB concentration range of 95 $\mu g/m^3$ to 105 $\mu g/m^3$ overlaps the DM range of 84 $\mu g/m^3$ to 156 $\mu g/m^3$. The Protocol recommends assigning a standard error of 30 percent to estimates made using EPA guideline dispersion models.

The refinements made to reconcile the differences in the modeled results are presented here by source category.

<u>Ore Crusher/Copper Ore.</u> The primary contributor to PM_{10} concentrations identified in the preliminary results of both models was the ore crusher. The influence of this source is more pronounced at the Garfield monitoring site than at the Hayden Jail site, due to the close proximity of the crusher to the Garfield monitor.

The wide range of DM over-and-under-prediction at both sites indicated that:

- source characteristics (i.e., stack parameters) were incorrect;
- single point source characterization was incorrect;
- emission rate was incorrect; or
- all of the above were true.

The stack parameters used in the modeling were reviewed and it was found that the exit velocity from the crusher stack was significantly underestimated. Photographs taken during a site visit also showed emissions from a transfer point between conveyors which is located to the east of the crusher building. This area was identified as a source of PM_{10} and a portion of the crusher emissions were assumed to be emitted from this point. The ISC model was exercised once again using the revised exit velocity at the crusher stack and emissions from the conveyor transfer point. The resulting concentrations showed much better agreement with the CMB results. Although the model continued to over-predict, it was apparent that the estimated emissions from the crusher were too large. Photographs of the crusher building showed that it was more enclosed than originally thought. Therefore, the amount of fugitive emissions contained in the original estimate were reduced.

The results also showed that for many cases, combined impacts from the crusher and copper ore sources exhibited generally good agreement with the CMB ore crusher impacts. Furthermore, the CMB results did not show copper ore impacts on any of the 15 days evaluated. Review of the source sampling data showed that the grab sample used to create the copper ore source profile was not of high quality. The lack

of any CMB-predicted copper ore contributions was most likely due to the use of a source fingerprint which was not representative of the source(s).

The copper ore impacts in the initial ISC modeling appeared to be excessively high, with maximum concentrations in excess of 90 $\mu g/m^3$. Because of the large uncertainty in estimating the emissions from the train ore dump and conveyor unloading activities at the ore storage area, the emissions from these sources were reduced.

Because the characteristics of ore storage and ore unloading sources (copper ore group) are probably very similar to those from the crusher and conveyor, the crusher and copper ore groups were combined for further reconciliation.

The model was run once again with the revised emission rates and the revised "copper ore" source group containing the copper ore sources and the crusher-related sources. The results showed generally good agreement with the CMB results. For example, the highest predicted CMB concentration was 179.33 $\mu g/m^3$ while ISC predicted a maximum concentration of 273.78 $\mu g/m^3$. The 15-day average impacts also agreed favorably with an average concentration of 73.75 $\mu g/m^3$ predicted by CMB and a value of 61.47 $\mu g/m^3$ estimated by ISC at the Garfield site. For this case, the ISC results were within one standard error of the CMB results. The models did not agree quite as well at the Jail monitor where the 15-day ISC-predicted impact of 12.10 $\mu g/m^3$ compared with a CMB-predicted concentration of 27.72 $\mu g/m^3$.

<u>Roadway Dust.</u> The predicted roadway dust concentrations showed generally good agreement, especially at the Jail monitor. However, on specific days where easterly winds were predominant, CMB results indicated no roadway dust impacts at either site while the DM predicted impacts at both monitor locations. The reason for the discrepancies was determined to be associated with the allocation of roadway emissions to area sources for dispersion modeling purposes. The emissions were reallocated to smaller area sources and/or point sources within the area source grids in close proximity to the monitor locations. These changes did not significantly improve model agreement. It was therefore determined that the initial area source allocation provided a generally good representation of roadway dust emissions in Hayden. For example, the maximum predicted roadway dust contributions were 46.82 $\mu g/m^3$ (CMB) and 39.90 $\mu g/m^3$ (ISC). The 15 day composite values also showed good agreement with average impacts of 23.21 $\mu g/m^3$ (ISC) and 20.71 $\mu g/m^3$ (CMB) predicted at the Jail site. These values agree within the one standard error prescribed in the <u>Protocol</u>. Model agreement was not as good at the Garfield site where the 15 day composite value of 13.46 $\mu g/m^3$ from the ISC modeling compared with a CMB-predicted concentration of 4.69 $\mu g/m^3$.

Copper Ore Tailings. The wind speeds during the 15 days of ambient sampling indicated that negligible impacts from the tailings piles would be expected. This was corroborated by the CMB results where no tailings impacts were predicted on 13 of the 15 days. However, two days show impacts in excess of 30 $\mu g/m^3$ at the Garfield monitor.

Because emissions from the tailings pile are a function of wind speed, the meteorological data for these two days were examined in an attempt to explain the high impacts. Wind measurements in the vicinity of the tailings pond indicated speeds above the nominal wind speed emission threshold for emissions of 11 miles per hour. The threshold speed for tailings emission generation was determined from on-site experiments using a portable wind tunnel. Thus, both days were evaluated with the ISC model using variable hourly emission rates which were based on the measured wind speeds. The results showed negligible impacts on both days. Further examination of the meteorological data revealed generally southeast flow on these days, that transported the majority of the emissions away from Hayden to the northwest. The discrepancies between the models could be attributable to the inability of the Gaussian-based dispersion model to address short-term phenomena such as wind gusts or dust devils. Such micro-meteorological events could transport tailings to the Garfield monitor, but not be adequately addressed by the model which uses a single wind speed and direction to represent an entire hour.

Locomotive Exhaust. Examination of the preliminary modeling results indicated that the initial locomotive exhaust emissions were overestimated. While the CMB analysis did not examine locomotive impacts specifically, it was assumed that any contributions would be contained within the "unexplained" category. On specific days, initial DM impacts from the locomotive sources greatly exceeded the CMB "unexplained" impacts. The emissions calculations were examined to reveal that the train activity levels used to determine the locomotive emissions were overestimated by a factor of four. Therefore, the emissions were reduced by 75 percent and the model was rerun.

Slag Dump. Initial DM predictions generally exceeded the CMB estimates, sometimes very significantly. The slag dump emissions were originally calculated using a roughly-estimated slag dumping rate of 20 ton/hour. This estimate was refined to approximately 10 ton/hour. Therefore, the original slag dump emissions were reduced by 50 percent. This determination by EPA's contractor, Engineering Science.

4.3 Summary of Model Reconciliation Analysis

The results of the receptor/dispersion model reconciliation analysis were summarized in order to determine the modeling technique(s) to be used for the control strategy development portion of the SIP.

Based on the refinements to the DM data base for the Hayden area described above, the models were compared again and found to show generally good agreement. Table 4.2 presents the results from the 15 day composite groupings while Tables 4.3, 4.4 and 4.5 present comparisons for days with similar dispersion modeling.

Overall, the ISC model tended to predict total PM_{10} concentrations which were in good agreement with the CMB estimates. Table 4.2 shows that copper ore impacts exhibited good agreement at the Garfield monitor while roadway dust concentrations agreed very well at the Jail site. The ISC model tended to under-predict roadway dust impacts at the Garfield site and the copper ore impacts at the Jail monitor. The impacts from the other source groups showed generally good agreement at both monitor locations.

Tables 4.3, 4.4 and 4.5 illustrate how the models compare for days exhibiting similar meteorological conditions. Table 4.3 shows that with predominantly easterly winds, ISC over-predicts roadway dust impacts and over-predicts copper ore concentrations at the Garfield site. The southerly winds characterizing Regime 2 (Table 4.4) show excellent agreement between the CMB and ISC (excluding background) at the Jail monitor and good agreement at Garfield. Table 4.5 shows that southeasterly winds result in excellent agreement at both monitors for roadway dust impacts and relatively poor agreement for copper ore impacts.

Linear regression analyses of total PM_{10} impacts from CMB and ISC were performed for both the preliminary and final modeling. Figure 4.2 presents the total predicted PM_{10} from the CMB and final ISC modeling analysis and the results of the regression analysis. The preliminary modeling results (not shown) showed poor agreement with correlation coefficients of -0.09 (Garfield) and -0.23 (Jail). Revisions to the ISC inputs described above resulted in a dramatic improvement in model agreement at the Garfield monitor location. The correlation at the Jail site was not, however, significantly improved.

Based on the analysis described above, the differences between the results of the two models which were indicated by the initial modeling were satisfactorily reconciled to justify the use of the ISCST dispersion model in the development of PM_{10} control strategies at Hayden.

TABLE 4.2

Final Modeling Results
Hayden PM_{10} Modeling - Model Reconciliation
All Days

Source Group	24-hr Impact (ug/m^3) Garfield CMB	Garfield ISC	Jail CMB	Jail ISC
Auto Exhaust	0.23 ± 0.12	0.42 ± 0.13	0.19 ± 0.14	0.39 ± 0.12
Roadway Dust	4.69 ± 2.46	13.46 ± 4.04	20.71 ± 4.69	23.21 ± 6.96
Tailings	5.29 ± 3.60	0.01 ± 0.00	0 ± 0.00	0 ± 0.00
Smelter Building Fug.	0.86 ± 0.66	1.02 ± 0.31	1.04 ± 0.66	1.11 ± 0.33
Slag Dump	0.06 ± 0.06	1.08 ± 0.32	0.03 ± 0.03	1.43 ± 0.43
Copper Ore	73.75 ± 14.73	61.47 ± 18.44	27.72 ± 7.51	12.10 ± 3.63
Lime Handling	0.34 ± 0.30	1.06 ± 0.32	0.57 ± 0.57	1.65 ± 0.50
Gypsum	1.63 ± 0.48	1.88 ± 0.56	2.94 ± 0.71	2.39 ± 0.72
Secondary SO_4	4.11 ± 0.43	—	4.03 ± 0.58	—
Other*	13.44 ± 5.03	4.82 ± 1.45	2.29 ± 1.66	2.30 ± 0.69
Background	—	16.00	—	16.00
All Sources	104.51	101.22	59.49	60.58
Total Measured	104.51		59.49	

* ISC: Woodburning, Locomotives, Windblown Dust, Stack
CMB: Unexplained

TABLE 4.3

Final Modeling Results
Hayden PM_{10} Modeling - Model Reconciliation
Regime 1

Source Group	24-hr Impact (ug/m^3) Garfield CMB	24-hr Impact (ug/m^3) Garfield ISC
Auto Exhaust	0 ± 0.00	0.38 ± 0.11
Roadway Dust	1.03 ± 1.03	11.54 ± 3.46
Tailings	22.94 ± 11.57	0.06 ± 0.02
Smelter Building Fug.	0.99 ± 0.99	1.31 ± 0.39
Slag Dump	0.03 ± 0.03	0.05 ± 0.02
Copper Ore	87.27 ± 47.28	120.69 ± 36.21
Lime Handling	1.49 ± 1.19	0.58 ± 0.17
Gypsum	0.13 ± 0.13	1.49 ± 0.45
Secondary SO_4	3.17 ± 0.93	—
Other*	40.81 ± 5.11	4.32 ± 1.30
Background	—	16.00
All Sources	157.85	156.42
Total Measured	157.85	—

* ISC: Woodburning, Locomotives, Windblown Dust, Stack
CMB: Unexplained

Regime 1 = 12/29/86, 1/11/87, 1/12/87
Wind Direction: East

TABLE 4.4

Final Modeling Results
Hayden PM_{10} Modeling - Model Reconciliation
Regime 2

Source Group	24-hr Impact (ug/m^3) Garfield CMB	Garfield ISC	Jail CMB	Jail ISC
Auto Exhaust	0.49 ± 0.30	0.40 ± 0.12	0.29 ± 0.29	0.44 ± 0.13
Roadway Dust	3.39 ± 2.57	12.66 ± 3.80	18.50 ± 8.00	23.07 ± 6.92
Tailings	—	—	—	—
Smelter Building Fug.	1.19 ± 1.10	0 ± 0.00	1.10 ± 0.97	0.01 ± 0.00
Slag Dump	0.02 ± 0.02	0 ± 0.00	0 ± 0.00	0.01 ± 0.00
Copper Ore	42.75 ± 5.44	27.94 ± 8.38	11.01 ± 1.39	11.84 ± 3.55
Lime Handling	0 ± 0.00	0.21 ± 0.06	0 ± 0.00	0.21 ± 0.06
Gypsum	2.29 ± 0.77	1.33 ± 0.40	2.41 ± 1.36	3.07 ± 0.92
Secondary SO_4	4.81 ± 0.73	—	4.77 ± 0.65	—
Other*	3.82 ± 2.75	4.59 ± 1.38	3.10 ± 1.38	2.50 ± 0.75
Background	—	16.00	—	16.00
All Sources	58.77	63.13	41.19	57.15
Total Measured	58.77		41.19	

* ISC: Woodburning, Locomotives, Windblown Dust, Stack
CMB: Unexplained

Regime 2 = 12/9/86, 12/18/86, 12/24/86, 1/7/87, 1/30/87
Wind Direction: South

TABLE 4.5

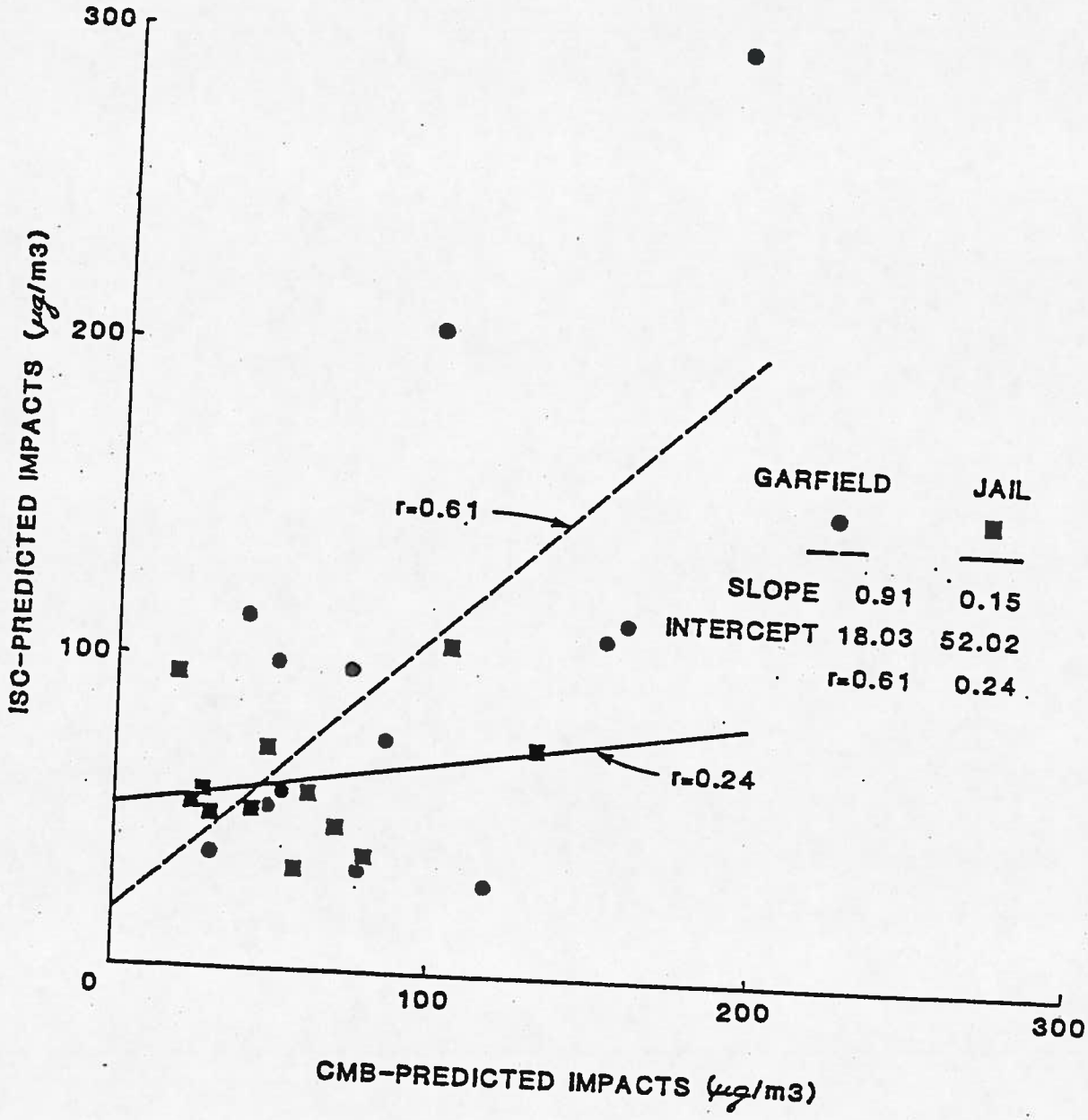
Final Modeling Results
Hayden PM_{10} Modeling - Model Reconciliation
Regime 3

Source Group	24-hr Impact (ug/m^3) Garfield CMB	Garfield ISC	Jail CMB	Jail ISC
Auto Exhaust	0.25 ± 0.25	0.50 ± 0.15	0 ± 0.00	0.34 ± 0.10
Roadway Dust	10.46 ± 6.14	10.77 ± 3.23	23.98 ± 5.97	22.28 ± 6.68
Tailings	—	—	—	—
Smelter Building Fug.	0.70 ± 0.63	1.23 ± 0.37	1.28 ± 1.01	2.53 ± 0.76
Slag Dump	0.18 ± 0.18	0.70 ± 0.21	0.01 ± 0.01	3.29 ± 0.99
Copper Ore	98.18 ± 27.74	34.97 ± 10.49	49.61 ± 12.51	14.62 ± 4.39
Lime Handling	0 ± 0.00	1.03 ± 0.31	0 ± 0.00	2.93 ± 0.88
Gypsum	1.85 ± 1.10	2.67 ± 0.80	3.26 ± 1.00	1.56 ± 0.47
Secondary SO_4	3.90 ± 0.97	—	3.92 ± 1.01	—
Other*	1.54 ± 3.64	4.46 ± 1.34	1.48 ± 2.14	1.95 ± 0.59
Background	—	16.00	—	16.00
All Sources	117.04	72.33	80.55	65.50
Total Measured	117.04		80.55	

* ISC: Woodburning, Locomotives, Windblown Dust, Stack
CMB: Unexplained

Regime 3 = 12/1/86, 12/4/86, 1/4/87, 1/27/87, 1/30/87
Wind Direction: Southeast

COMPARISON OF CMB AND FINAL ISC MODEL PREDICTIONS OF PM_{10} CONCENTRATIONS



5.0 BASE YEAR DISPERSION MODELING

Prior to the development of the emissions control strategies, maximum 24-hour and annual-average PM_{10} concentrations associated with the base year emissions need to be determined. This is generally done using dispersion modeling of the base year (1986) PM10 emission inventory. The Guideline on Air Quality Models (Revised) provides guidance on dispersion modeling of particulate matter and lists preferred models for this purpose.

For Hayden, the ISCST model was selected to calculate the 24-hour and annual-average concentrations associated with the "final" 1986 PM_{10} emission inventory. The final inventory used was developed in the receptor/ dispersion model reconciliation analysis presented in Section 4 of this report. One year of site-specific sequential hourly meteorological data collected in 1983 were used as inputs to the model. A description of the ISCST model and the meteorological data are presented in Section 2.3 of this report. A receptor grid that defined the nonattainment area and encompassed the towns of Hayden and Winkleman was deployed to locate the maximum 24-hour and annual-average impacts. The receptors were spaced at 400 m intervals within a 2 mile x 2 mile area. Receptors were also placed at the location of the Jail and Garfield monitor locations which were used in the model reconciliation analysis.

The PM_{10} SIP Guideline Document states that design concentrations can be based on ambient measurements of PM_{10} or model estimates of ambient concentrations. Ideally, modeling estimates using five years of National Weather Service meteorological or at least one year of on-site data and three years of air quality measurements should be considered in determining 24-hour design concentrations. Approximately two years of monitored PM_{10} data and modeling results using one year of site-specific meteorological data were used to determine the 24-hour and annual design concentrations at Hayden.

The PM_{10} SIP Guideline Document provides a table lookup procedure for determining which measured PM10 concentration should be considered in the determination of the 24-hour design concentration. This procedure is based on the total number of measured 24-hour PM_{10} concentrations and is summarized in Table 5.1. For Hayden, the highest concentration measured at the Jail monitor was selected since 57 samples were collected during 1985 and 1986.

The Modeling Guideline indicates that when 5 years of weather service data or at least 1 year of site-specific data are used to estimate modeled impacts, the highest second-highest short-term concentration should be considered in the design concentration determination process. If it is determined that the on-site data may not be temporally representative, the highest concentration should be used as the design concentration. Because one year of site-specific meteorological data were used in the modeling for Hayden, the highest second-highest modeled 24-hour concentration

TABLE 5.1

Tabular Estimation of PM_{10} Design Concentrations

Number of Daily Values	Rank of Upper Bound	Rank of Lower Bound	Data Point Used for Design Concentration
$\leq$ 347	—	1	Highest Value
348 - 695	1	2	Second Highest Value
696 - 1042	2	3	Third Highest Value
1043 - 1096	3	4	Fourth Highest Value

was selected for evaluation as the design concentration.

The design concentrations selected for control strategy development are the highest of the monitored or modeled values.

5.1 24-hour Design Concentration

The maximum 24-hour PM_{10} concentration measured in Hayden between 1985 and 1986 was 243 $\mu g/m^3$ while the maximum modeled concentration was 618 $\mu g/m^3$. The maximum modeled concentration occurred at the Garfield monitor site with major contributions from the copper ore sources, roadway dust and locomotive exhaust emissions. Based on the selection criteria set forth in the Guideline Document and the Modeling Guideline, the design concentration was determined to be 618 $\mu g/m^3$. This concentration provides the basis for the control strategies needed to meet and maintain the 24-hour NAAQS of 150 $\mu g/m^3$.

5.2 Annual Arithmetic Mean Design Concentration

The maximum annual arithmetic mean PM_{10} concentration measured in Hayden in 1985 and 1986 was 80 $\mu g/m^3$. The maximum modeled concentration was 103 $\mu g/m^3$. As with the maximum modeled 24-hour concentration, the maximum annual-average concentration occurred at the Garfield monitor site with major contributions from the same sources discussed above. Thus, the value of 103 $\mu g/m^3$ was selected as the annual-average design concentration and provides the basis for the control strategies needed to meet and maintain the annual arithmetic mean NAAQS of 50 $\mu g/m^3$.

6.0 CONTROL STRATEGY ALTERNATIVES - PM_{10}

The preceding sections describe the methods and procedures for data base development, establishment of source-receptor relationships through receptor modeling, dispersion modeling techniques and determination of base year PM_{10} annual arithmetic mean and 24-hour concentrations. This section will discuss the ambient PM_{10} concentration reductions needed to achieve the NAAQS and the emission reduction options available for each source category.

6.1 Emission Reductions Needed to Attain NAAQS

Section 6.4 of the PM_{10} Guideline Document describes the following procedure for calculating the total reduction (TR) in pollutant concentration and the associated emission reductions needed to achieve the PM_{10} NAAQS:

$$TR\ (\mu g/m^3) = PM_{10}\ \text{Design Concentration} - PM_{10}\ \text{NAAQS}$$

If a design concentration is greater than the NAAQS (TR is positive), as is the case for the Hayden area, a reduction in PM_{10} emissions is required. This might be accomplished by reducing the contribution of a single source or it may require reduction in several individual sources or source categories so that

$$TR\ (\mu g/m^3) = \delta\ ISRi\ (\mu g/m3)$$

where ISRi is the Individual Source Reduction (as expressed in terms of ambient concentration reduction for each source) desired from a source or source category i.

These ISRs are generally selected based on many considerations, including the technical and economic feasibility of achieving a given emission reduction or additional reduction at that source. The percent reduction in emissions (%RE) for a source or source category is given by

$$\%REi = ISRi\ (\mu g/m^3)\ /\ ACi\ (\mu g/m^3)$$

where AC is the ambient concentration due to the individual source (i) or source category as determined through modeling.

The Hayden base year modeling results indicate that attaining the 24-hour NAAQS will require a more restrictive control strategy than attainment of the annual arithmetic mean (AAM) NAAQS. This control strategy developed for attaining the 24-hour NAAQS should still be applied to the AAM averaging time to assure attainment and maintenance of the AAM NAAQS.

6.1.1 24-Hour Maxima

Because the short-term concentrations appear to be "controlling", these concentrations were examined first. Table 6.1 lists the relative source contributions to the 1986 24-hour design value. The table shows that the main contributing sources are copper ore crushing and conveying, roadways, and locomotive exhaust. The total required reduction necessary at Hayden to meet the 24-hour NAAQS based on the 1986 design value is as follows (the 24-hour concentration shown here and in the remainder of this document refer to the highest second high 24-hour value):

$TR = 618 - 150 = 468\ \mu g/m^3$
($150\ \mu g/m^3$ is the 24-hour Average PM_{10} NAAQS)

This indication of needed reduction, however, neglects the growth potential during the period between the 1986 design value and the 1991 attainment date, and neglects also the potential impacts of "banked emissions", i.e. those permitted sources not operating or operating at less than a normal rate. Growth and banked emissions must be considered for both 1990 attainment and for NAAQS maintenance through 1997.

6.1.2 Annual Arithmetic Mean

Table 6.2 lists the relative source concentrations to the 1986 AAM design value. The total required reduction to meet the 1986 AAM NAAQS is as follows:

$TR = 102.5 - 50 = 52.5\ \mu g/m^3$
($50\ \mu g/m3$ is the AAM NAAQS)

The influence of growth and banked emissions for 1990 and 1997 will, in the case of Hayden, increase the reductions required for NAAQS attainment and maintenance.

6.2 Growth Projections and Banked Emissions

Few guidelines exist for estimating growth and its air quality impacts. For the Hayden area, contact with city officials and the Pinal-Gila Counties Air Quality Control District indicated near-term growth in the Hayden area is entirely dependent on the copper industry; the officials did not foresee growth in the area from retirees seeking a warm climate as is the case in other Arizona areas.

The ASARCO smelter operation is not expected to significantly increase production because of limited equipment capacity and restrictions on sulfur dioxide emissions. The Ray smelter (known previously as Kennecott Smelter), although not operated since before 1980, still has potential banked emissions. Resumption of operation would cause increases in ore crushing and conveying, in locomotive traffic, and in traffic on both paved and unpaved streets and roads. It was assumed that the Ray smelter when operating would share the current ore transport, unloading,

TABLE 6.1

Source Category Contributions (ug/m^3)
to 1986 Base Year 24-Hour PM_{10} Design Value[1]

Source Category	Contributions to Ambient Concentrations (ug/m^3)
Copper Ore, Unloading, Crushing, Conveying	410.8
Road Dust (Excluding Kennecott and Canyon Roads)	100.5
Locomotives	58.8
Kennecott and Canyon Road Dust	5.3
Gypsum	10.2
All Others	16.2
Background	16.0
Total All Sources	618

[1]Garfield monitor location of point highest second high 24-hour concentrations.

TABLE 6.2

Source Category Contributions (ug/m^3) to 1986 PM_{10} AAM Design Value[1]

Source Category	Contributions to Ambient Concentrations (ug/m^3)
Copper Ore, Unloading, Crushing, Conveying	61.7
Road Dust (Excluding Kennecott and Canyon Roads)	11.0
Locomotives	5.4
Kennecott and Canyon Road Dust	2.1
Gypsum	1.9
All Others	4.4
Background	16.0
Total (All Sources)	102.5

[1]Garfield monitor location of point of maximum AAM.

crushing, and conveying system. The 1990 projections include the banked Ray emissions and a 10 percent increase in locomotive use. The overall vehicle traffic from the increased activity and employment was presumed to be an effective source of PM10 pollution for the year 1990. Table 6.3 lists the source contributions and highest 24-hour concentrations for 1990. Table 6.4 lists the maximum AAM concentrations for 1990. The Ray Smelter (known previously as the Kennecott smelter), has not operated since June 1982. Since there is a high likelihood that this smelter will again become operational, it is presumed that its start-up will increase ore crushing and conveying, locomotive traffic, and traffic on both paved and unpaved roads. The start-up of the Ray smelter, however, will not increase the current ore transport, unloading, crushing, and conveying system. This is due to the fact that a new ore crushing facility will be established at the mine, which is outside the PM_{10} Group I area. Since the Ray smelter and additional facilities are not scheduled to become operational prior to 1990, the 1990 projections include no growth for the ore unloading, crushing and conveying, and locomotive activities. The overall vehicle traffic is, however, presumed to increase by 10 percent. Even though this increase does not reflect the reality of "no-growth" in Hayden, it provides preventive control measures for the years to follow. Table 6.3 lists the source contributions and highest 24-hour concentrations for 1990. Table 6.4 lists the maximum AAM concentrations for 1990.

For 1997, it was estimated that smelter-related sources would remain unchanged but that vehicle traffic would increase by 20 percent over 1990 levels and that the "all other" and "background categories" would increase by 10 percent over 1990 levels. The projections of 1997 air quality must consider the results of the control strategy implemented to meet the NAAQS in 1990. The control strategy becomes an iterative procedure, with selection of a 1990 control strategy application of 1997 projections, and adjustments to the 1990 control strategy to maintain the NAAQS through 1997. For 1997, it was presumed that the Ray smelter would become operational. Additionally, new facilities for which installation permits are presently applied for will be built in the years between 1990 and 1997. Based on the application for the new facilities, a 25 percent growth in ore unloading, crushing, and conveying is presumed to occur. Furthermore, the possible operation of the Ray smelter is presumed to generate emissions (24-hour and annual) equivalent to 75 percent of the existing smelter at the Hayden facility. Based on a 90 percent control of PM_{10} emissions, which will be imposed on the existing smelter, an estimated annual controlled emission rate of 6.6 tons per year would result. Using this emission rate and other stack parameters, a modeled conservative maximum 24-hour average ambient concentration of 0.4 microgrms per cubic meter would result. A similar value for the annual average would be 0.1 micrograms per cubic meter.

The acid plant PM_{10} emission rate was assumed to be one-fifth of the smelter stack emission rate. Combined with appropriate

stack parameters, this also yielded an estimated maximum 24-hour average ambient concentration of 0.4 microgram per cubic meter. The resultant annual impact would be 0.1 micrograms per cubic meter.

Combining the Ray smelter and its associated acid plant would result in a maximum 24-hour average concentration of 0.8 micrograms per cubic meter and an annual average of 0.2 micrograms per cubic meter. These figures are reflected in the 1997 projections (See Tables 11.1 and 11.2).

Associated with the new facilities, the traffic on paved and unpaved roads and locomotive activities is presumed to increase by 10 percent over the 1990 levels. The projection of 1997 air quality must consider the results of the control strategy implemented to meet the NAAQS in 1990. The control strategy becomes an iterative procedure, with selection of a 1990 control strategy application of 1997 projections, and adjustments to the 1990 control strategy to maintain the NAAQS through 1997. An alternative would be implementation of further controls between 1990 and 1997. The projected air quality for 1997 will be shown in Section ~~7~~ 11 based upon the 1990 air quality resulting from implementation of the control strategy.

6.3 Emission Reductions Needed for 1990 NAAQS Compliance

Modeled 1990 Hayden area air quality with the ~~banked~~ Ray smelter emissions and no additional controls beyond 1986 levels showed the area of maximum impact still to be near the Garfield monitor. The largest impacting sources were the ore unloading, crushing, and conveying operations. Neither the Ray smelter nor the ASARCO smelter pyrometalurgical activities had significant impacts on maximum PM_{10} concentrations. Because the maxima occurred on calm days, the tailings pile emissions also were not evident. Separate modeling for days of high winds still did not show exceedances resulting from tailings pile emissions.

6.3.1 Needed Reductions for 1990 NAAQS Attainment

Tables 6.3 and 6.4 list the 1990 projected 24-hour and annual average PM_{10} concentrations before control strategy implementation. The total reductions of 1990 PM_{10} levels needed to attain the NAAQS are given below.

24-hour maximum

$$TR\ (\mu g/m^3) = \cancel{677} - \cancel{150} = \cancel{527}\ \mu g/m^3$$
$$630 - 150 = 480$$

Annual Arithmetic Mean

$$TR\ (\mu g/m^3) = \cancel{110.9} - \cancel{50} = \cancel{60.9}\ \mu g/m^3$$
$$104.2 - 50 = 54.2$$

Table 6.3

1990 Source Category Contributions (µg/m3)
for 24-Hour Maximum[1]
PM10 Concentrations

Source Category	Contribution to Ambient Concentrations (µg/m3)
Copper Ore, Unloading, Crushing, Conveying	410.8
Unpaved Road Dust (Excluding Kennecott and Canyon Dr.)	80.7
Paved Road Dust	29.9
Locomotives	58.8
Kennecott and Canyon Drive	5.8
Gypsum	10.2
All Others	17.8
Background	16.0
Total All Sources	630.0

1 24-Hour maximum refers to highest second high concentrations.

Table 6.4

1990 Source Category Contribution (μg/m3)
for AAM PM10 Concentrations

Source Category	Contribution to Ambient Concentrations (μg/m3)
Copper Ore, Unloading, Crushing, Conveying	61.7
Unpaved Road Dust (Excluding Kennecott and Canyon Dr.)	8.8
Paved Road Dust	3.3
Locomotives	5.4
Kennecott and Canyon Drive	2.3
Gypsum	1.9
All Others	4.8
Background	16.0
Total All Sources	104.2

7.0 SOURCE SPECIFIC CONTROL OPTIONS AND IMPLEMENTATION

This section will describe the process of selecting control strategies that achieve the NAAQS for PM_{10}, and a compliance program to maintain these standards through 1997. This section will also identify the implementation process, and list the appropriate implementation schedule.

7.1 COPPER ORE UNLOADING, CRUSHING, AND CONVEYING

7.1.1 DESCRIPTION OF SOURCE CATEGORY AND CURRENT CONTROLS

The greatest contributors to monitored PM_{10} levels in the Hayden Group I area are the copper ore unloading, crushing and conveying facilities at the Ray Unit crushing plant. ISC modeling attributes ~~451.9~~ 410.8 $\mu g/m^3$ (~~67~~ 65%) of the 1990 24-hour design concentration of ~~677~~ 630 $\mu g/m^3$ and ~~67.9~~ 61.7 $\mu g/m^3$ (~~61~~ 59%) of the 1990 annual design concentration of ~~110.9~~ 104.2 $\mu g/m^3$ to these facilities. <u>See</u> Tables 7.1 and 7.2. The crushing plant's large contribution is not surprising, given that its primary purpose is to crush large rocks into smaller particles.

This source category consists of four separate structures: (1) a track hopper feeding the Ray crusher building and associated underground conveyor belts, (2) a crusher building (which contains secondary and tertiary crushers and numerous transfer points), (3) an exterior transfer tower, and (4) a conveyor leading from the crushing plant to the concentrator building. These are depicted schematically in Figure 7.1. Their locations within the Town of Hayden are shown in Figure 7.2. The parenthetical numbers in the following detailed source description correspond to the equipment identification numbers in Figure 7.1.

The track hopper is a station for dumping rail loads of copper ore. Trains (1) release their loads into an underground hopper (2). This operation generates fugitive dust. A flat roof over the station provides very limited control of these emissions, as the sides are exposed. The hopper itself discharges onto a series of belt feeders (3), which in turn feed three parallel underground belts leading to the crusher building (collectively, 4).

These conveyors emerge within the crusher building and discharge into a screen (6), which separates coarser material ("oversize") requiring additional crushing from smaller ("undersize") material that may need little or no additional crushing. The drop from the conveyors (4) onto the screen (6) is a minor source of fugitive emissions. A chute leads the oversize material into a standard secondary crusher (7). This transfer also is a minor source of fugitive dust, as the transfer is mostly enclosed and is ventilated to the existing scrubber system.

Material that passes through the secondary crusher and intermediate "undersize" from the screen drops to conveyor C2 (9).

Table 7.1

1990 Source Category Contributions (μg/m3)
for 24-Hour Maximum[1]
PM10 Concentrations

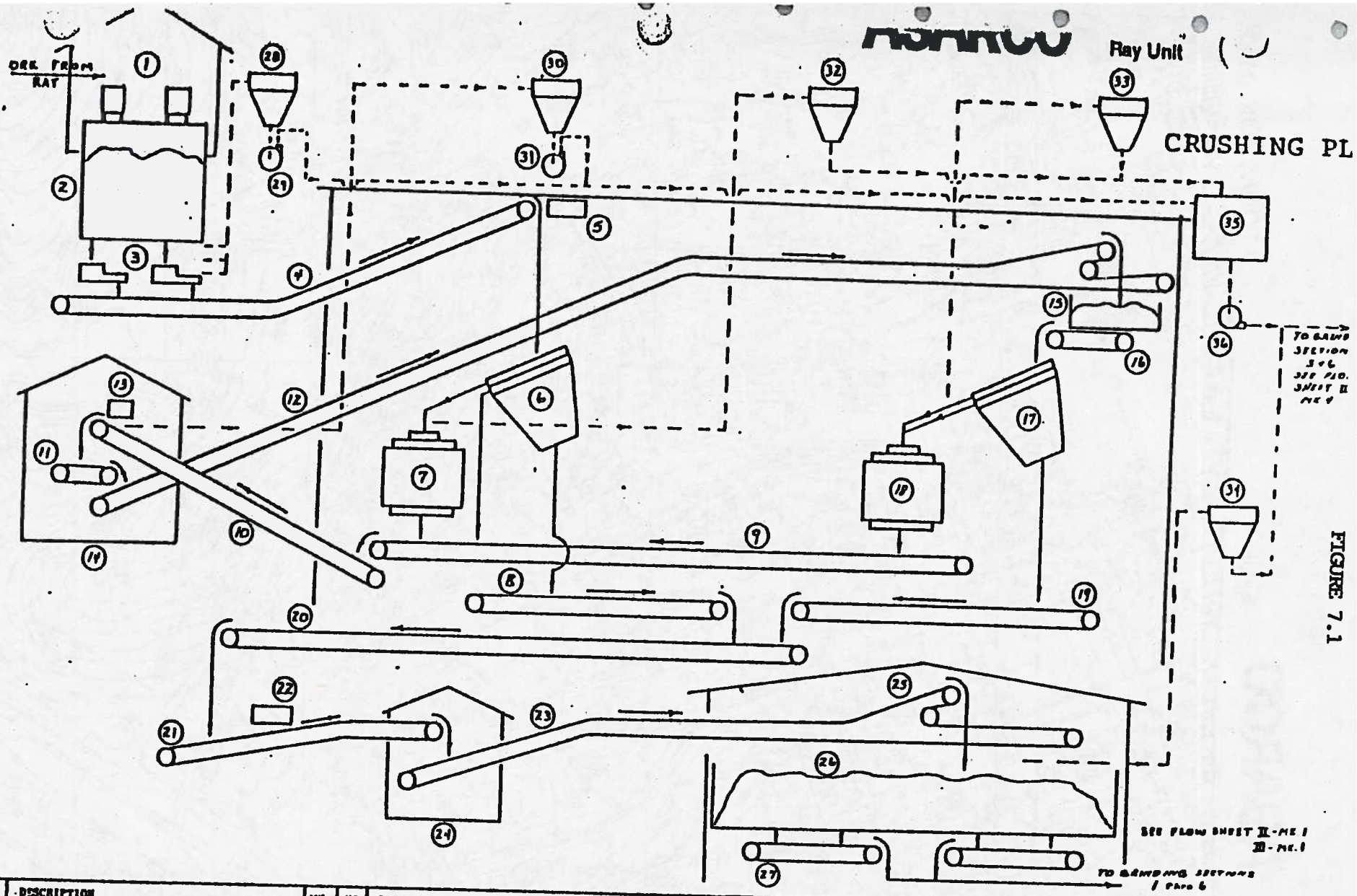
Source Category	Contribution to Ambient Concentrations (μg/m3)
Copper Ore, Unloading, Crushing, Conveying	410.8
Unpaved Road Dust (Excluding Kennecott and Canyon Dr.)	80.7
Paved Road Dust	29.9
Locomotives	58.8
Kennecott and Canyon Drive	5.8
Gypsum	10.2
All Others	17.8
Background	16.0
Total All Sources	630.0

1 24-Hour maximum refers to highest second high concentrations.

Table 7.2

1990 Source Category Contribution (μg/m3)
for AAM PM10 Concentrations

Source Category	Contribution to Ambient Concentrations (μg/m3)
Copper Ore, Unloading, Crushing, Conveying	61.7
Unpaved Road Dust (Excluding Kennecott and Canyon Dr.)	8.8
Paved Road Dust	3.3
Locomotives	5.4
Kennecott and Canyon Drive	2.3
Gypsum	1.9
All Others	4.8
Background	16.0
Total All Sources	104.2



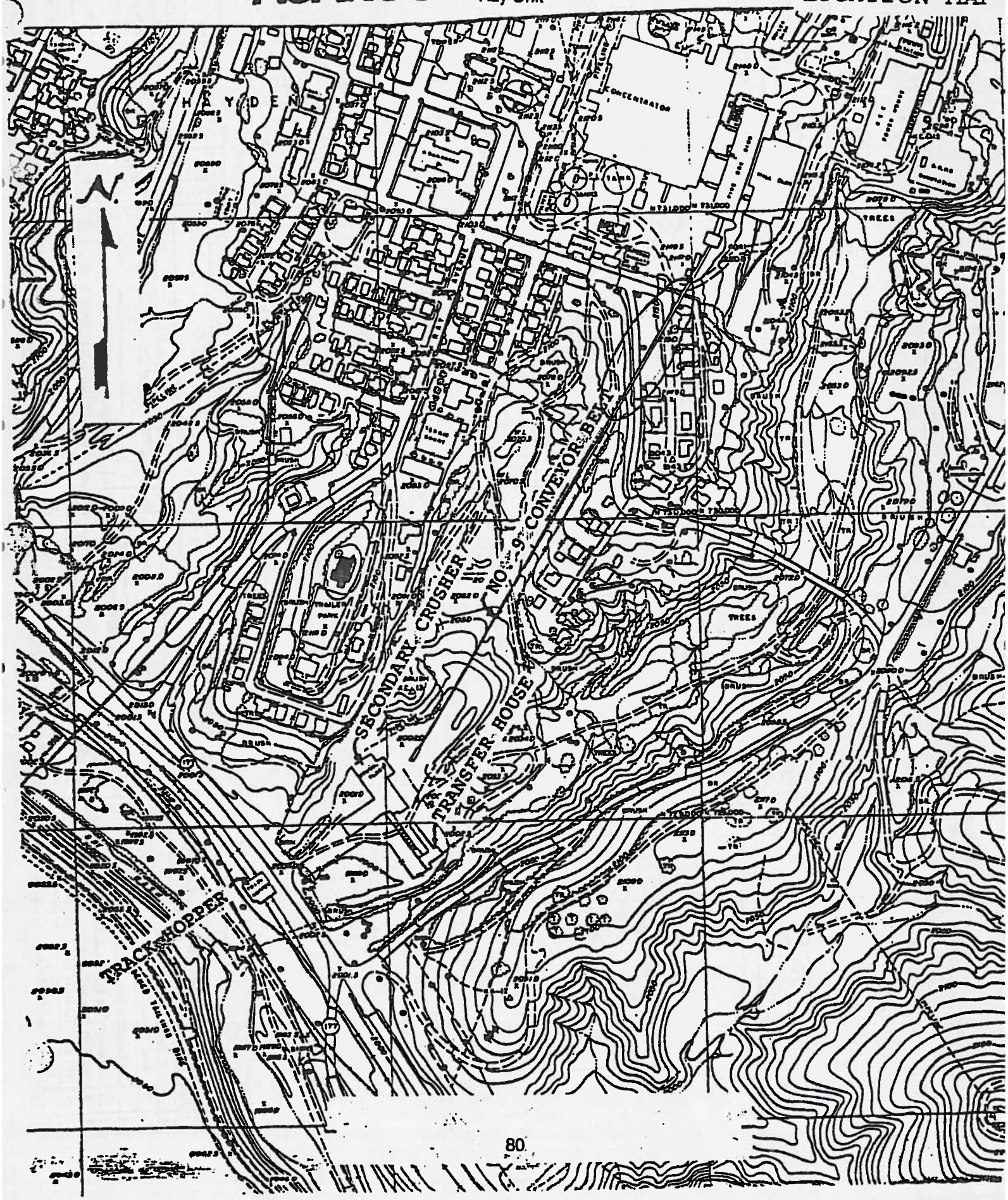
MK	NO	DESCRIPTION	MK	NO	DESCRIPTION	MK	NO	DESCRIPTION	MK	NO	DESCRIPTION
1		100 Ton Ore Cars	11	1	60" Belt Conveyor #4	21	1	42" Belt Conveyor #9	31	1	Vertical Sand Pump
2		5000 Ton Track Hopper	12	1	60" Belt Conveyor #5	22	2	Weightometer	32	2	Roto-clone Dust Collector
3	6	48" Periproceeding Plate Feeders	13	1	Dings Magnet	23	1	40" Belt Conveyor #10	33	1	Roto-clone Dust Collector
4	3	48" Belt Conveyor #1A, B, C	14	1	Transfer House	24	1	Transfer House	34	1	Roto-clone Dust Collector
5	3	Dings Magnet	15	1	600 Ton Ore Bin	25	1	Tripper	35	1	Collecting Sump
6	3	Double Deck Screen - 6' x 12'	16	5	60" Belt Feeder, Variable Speed	26	1	Fine Ore Bin - 27,000 Tons Dead	36	5	Pump, Slurry
7	3	Standard Cone Crusher - 7'	17	3	Double Deck Screen - 6' x 16'	27	12	42" Belt Feeder - Variable Speed			
8	1	42" Belt Conveyor #6	18	5	Short Head Cone Crusher - 7'	28	1	Cyclone Dust Collector			
9	1	60" Belt Conveyor #2	19	1	48" Belt Conveyor #7	29	1	Pump, Slurry 3" x 3"			
10	1	60" Belt Conveyor #3	20	1	42" Belt Conveyor #8	30	1	Roto-clone Dust Collector			

FIGURE 7.1

FIGURE 7.2

ASARCO Ray Unit

LOCATION MAP



These drop points are significant sources of fugitive dust because the material is finely crushed (minus one-inch mesh), and the entire day's run of ore passes through this part of the crushing circuit. Although conveyor C2 is in the basement of the building, these emissions still escape into ambient air through doorways and other openings in the building.

Secondary-crushed ore on conveyor C2 passes through a transfer onto conveyor C3 (10), which leads to the transfer house (14). This separate building contains several transfer points ultimately carrying the ore to an inclined belt (12) returning the ore to the top of the building for another pass through the crushing circuit. The transfer house accounts for a clear majority of the Ray Unit crushing plant's fugitive emissions because of inadequate hooding and ventilation for the fine materials.

The inclined conveyor returning the ore to the crusher building (12) ends as a "tripper conveyor" at an ore bin (15). The tripper conveyor spreads ore across the bin. It is a significant fugitive dust source because transfers occur along its length and it is ineffectively controlled. The control on this source, a "dust seal" rubber damper, is excessively worn.

Belts (16) draw material out of the bin (15) onto another screen (17) to separate oversize material for further crushing (18) from fine ore. The transfer from this screen (17) to the tertiary ("shorthead") crusher (18) is evacuated to the scrubber system. Crushed material drops onto conveyor C2 (9), which ultimately returns the ore to the bin near the top of the buildings. This drop is a significant fugitive dust source.

Material fine enough to pass completely through either screen (6, 17) drops onto one of two conveyors (8, 19), which lie underneath the building. These conveyors join at a drop onto conveyor C8 (20), which discharges onto conveyor C9 (21). Conveyor C9, the last component of this first source category, is a covered belt leading to the fine ore bin (26) at the concentrator building, which is 2200 feet north-east of the crushing building.

The floors of the crusher building and transfer house are major sources of fugitive dust. Fugitive dust generated at other points in the building forms layers on the floor, and is later reentrained by traffic in the building.

Process emissions are currently captured at numerous points within the crusher building, and are treated in a total of five dust collectors. Process emissions captured in the transfer house are ducted to a sixth Rotoclone scrubber. As noted above, the Rotoclone venting the track hopper is not operational.

7.1.2 PROPOSED CONTROL STRATEGY

This SIP requires ASARCO to replace inefficient dust collectors on process sources, add further hooding on and venting

of some fugitive dust sources, and use water sprays and other work practices on others.

7.1.2.1 Controls on Stack Sources

Dump Hopper. ASARCO will install a new Ducon UW4 dust collector of 15,000 acfm to replace the existing, unused 12,000 acfm Rotoclone dust collector evacuating the dump hopper (28).

Crusher Building. ASARCO will replace the three inefficient Rotoclone dust collectors evacuating the crusher building with three new Ducon UW4 units. The units to be replaced have declined in efficiency since their installation in 1959 (No. 4), 1967 (No. 5), and 1979 (No. 2). Although rated at 33,000 acfm each, recent tests of two units measured a flow volume of only 24,500 acfm. The new units are rated at 36,000 acfm and have guaranteed removal efficiencies of 99.5%. Actual removal efficiencies will approach 99.9%. The two newer (1985 and 1986), efficient units at the crushing building will remain in operation.

Transfer Tower. The existing 12,000 acfm Rotoclone dust collector evacuating the transfer tower (30), which was installed in 1960, will be replaced with a 15,000 acfm Ducon UW4 unit.

ASARCO has filed Class B installation permits for all new scrubbers, which will be approved within the calendar year 1989.

7.1.2.2 Controls on Fugitive Dust Sources

ASARCO is in the process of enclosing certain fugitive dust sources within the Ray Unit crushing plant, so that they will be vented to dust collectors. This has the effect of converting uncontrolled fugitive dust sources to well-controlled process sources. For certain emission areas that cannot be fully enclosed, ASARCO has implemented wet suppression techniques. The specific fugitive dust measures included in this plan are as follows:

Dump Hopper. ASARCO recently reduced fugitive emissions from the dump hopper (1,2) by installing and using a spray system while dumping cars. This was done in three phases completed in August, 1988:

South Side - 4 sprays, ~~1.4 gpm each.~~

North Side - 4 sprays, ~~1.4 gpm each.~~

Center - 4 sprays to each side on two separate headers, ~~1.4 gpm each.~~

Crusher Building. Numerous changes within the crusher building are being made to reduce fugitive emissions. The changes involve installation of hooding and use of water sprays.

ASARCO recently installed additional hooding on conveyor C2 (9) to cover the open area of the belt between the shorthead (17) and standard crusher (7) drop points. The transfer between conveyors C2 (9) and C3 (10) will be hooded, vented and sprayed (two sprays, ~~1.4 gpm each~~). By December 30, 1989, ASARCO will install a new dust seal on the No. 5 tripper conveyor (12).

Sixteen sprays (1.4 gpm each) were recently installed on conveyor C2 (9) before and after each of the eight crusher drop points. The discharge point from the conveyors C6 and C7 (8 and 19) also are controlled by two sprays each (1.4 gpm) installed in September, 1988.

ASARCO also has implemented new work practices to prevent re-entrainment of dust on the floor of the crusher building. It recently began using weekly water washdowns of the lower floors of the crusher building, rather than sweeping. Beginning in early 1990, ASARCO also will use a vacuum truck on the buildings' ground-level and basement floors.

Transfer Tower. The transfer tower (14) is estimated to be responsible for 70% of the fugitive dust generated by the Ray Unit crushing plant. See Table 7.3. Therefore, it has been targeted for major improvements.

ASARCO recently fabricated and installed a dust hood over conveyor C4 (11), which is located at the transfer tower, to connect the feed chute and discharge chute. It has redesigned, fabricated and installed a new hood over the transfer chute between conveyors C4 and C5 (11 and 12) to totally enclose the area. ASARCO installed two sprays (1.4 gpm each) on each of the C3 (10) to C4 (11) and C4 to C5 (12) conveyor transfer chutes at the end of August, 1988.

ASARCO also will begin weekly water washdowns of the transfer house floor in September 1989. A sump is being constructed to collect washdown solids.

Conveyor C9. Although not a measurable source of overall PM_{10} loadings, conveyor C9 (21) can cause local concern because it passes directly over residences on its way to the concentrator building. See Figure 7.2. The belt is covered, with its sides angled at 15°. ASARCO is in the process of increasing the angle of the idlers on conveyor C9 to 35 degree as old idlers wear out. In addition, conveyor C9 will be 180° enclosed on the sections passing over Fourth Street, Hillcrest Avenue, and Smelter Road six month after the issuance of ASARCO's 1989 operating permit. This will further reduce exposure of conveyed material to the wind.

Table 7.3

Attribution of Fugitive Emissions
Among Ray Unit Crushing Plant Structures

Structure	Contribution (%)	Ambient Levels	
Track Hopper	5	(0.05 x 225.9 $\mu g/m^3$=)	11.3
Crusher Building	25	(0.25 x 225.9 $\mu g/m^3$=)	56.5
Transfer House	70	(0.70 x 225.9 $\mu g/m^3$=)	158.1
Conveyor C9	0		0
TOTAL	100		225.9

7.1.3 DEMONSTRATION OF EFFECTIVENESS

Engineering-Science estimates that 45% of the crushing plant's emissions are vented through dust collectors and stacks (the existing Rotoclones), whereas 55% escapes as fugitive dust. See Demonstration SIP, at 6.10. This apportionment means that process emissions contribute ~~203.4~~ 184.9 $\mu g/m^3$ to the 24-hour design concentration and fugitive emissions ~~248.5~~ 225.9 $\mu g/m^3$. See Tables 8.1 & 8.2.

Engineering-Science's control strategy calls for a 90% reduction in emissions from the Ray Unit crushing plant. See Demonstration SIP, Table 6.5. The dust control plans described in section 7.1.2 will reduce stack emissions by 94.6% and fugitive emissions by ~~86.7%~~ 86.9%, for an overall reduction of ~~90.2%~~ 90.4%.

7.1.3.1 Stack Emissions

Engineering-Science assumes that current scrubbers are 95% efficient. The scrubber network in place after issuance of the installation permit will be required to meet a grain-loading standard of 0.05 gr/dscf. Based on observed average inlet grain-loadings of 18.4 gr/dscf, attainment of this new 0.05 gr/dscf limit will require operation at 99.73% efficiency:

$$\frac{18.4-0.05}{18.4} \times 100 = 99.73\%$$

This increase in efficiency from 95% to 99.73% represents a 94.6% decrease in current emission levels:

$$\frac{99.73-95.0}{100-95.0} \times 100 = 94.6\%$$

The effect of this decrease on the 24-hour and annual design concentrations is shown in Tables 8.1 and 8.2.

7.1.3.2 Fugitive Emissions

In order to gauge the effect of the fugitive emissions control strategy at the Ray Unit crushing plant, it was necessary to apportion the total crushing plant fugitive emissions impact of ~~248.5~~ 225.9 $\mu g/m^3$ (24-hour average) to each fugitive emissions source at the crushing plant. This was accomplished by the collective, considered observations of personnel familiar with the crushing plant's operations and emissions.

Initial Apportionment Among Structures. As noted in the source description (Section 7.1.1), the Ray crushing plant consists of four distinct structures (the track hopper, the crusher building, the transfer house and conveyor C9). Based on observation and engineering judgment, each structure's share of the plant's total fugitive emissions impact (~~248.5~~ 225.9 $\mu g/m^3$, 24-hour average) was determined as shown in Table 7.3.

The next step in the process was to determine the effect of the control strategy on each structure's contribution to the crushing plant's total fugitive emissions impact:

Track Hopper. This source has been essentially uncontrolled. It is estimated that 70% of the fugitive emissions from train unloading operations escape from the sides of the station at ground level, and 30% emanate from the underground transfer operations.

The newly installed water sprays on the station's roof are estimated to be 75% efficient. See H.E. Hesketh & F.L. Cross, Jr., Fugitive Emissions and Controls 79 (1983). These sprays, therefore, will reduce the ambient impact of ground-level emissions from 9.1 $\mu g/m^3$ (=13 $\mu g/m^3$ x (100-70)%) to 2.7 $\mu g/m^3$.

The addition of a 99.73% efficient dust collector will reduce the ambient contribution of emissions from under the track hopper from 3.9 $\mu g/m^3$ to 0.0 $\mu g/m^3$.

Combined, the efficiency of these two controls is 79.2%:

$$\frac{13 - 2.71}{13} \times 100 = 79.2\%$$

The effect of this decrease in fugitive emissions from the track hopper on the total ambient impact of the crushing plant's fugitive emissions is shown in Table 7.6.

Crusher Building. The determination of the effect of controls on crusher building fugitive emissions required further apportionment (on a relative basis) of total building emissions to each fugitive dust source within the building. The results of this analysis are presented in Table 7.4, which shows that overall fugitive emissions from the crusher building will be reduced by 71.4%. The effect of this reduction on the crushing plant's fugitive emissions impact is shown in Table 7.6.

Transfer Tower. Fugitive emissions from the transfer tower will be reduced by 93% as demonstrated in Table 7.5.

Summary of Fugitive Emissions Control Strategy Effectiveness. The net effect of fugitive emission controls on the crushing plant's ambient impact is shown in Table 7.6. As that table indicates, fugitive emissions will decrease by an overall 86.9%. The effect of this decrease on 1990 design concentrations is shown in Tables 8.1 and 8.2.

7.1.4 MEANS OF IMPLEMENTATION

Operating and Installation Permits will be issued before the end of calendar year 1989.

TABLE 7.4

Ray Unit Crushing Building
Fugitive Emission Sources and Controls

Source Description	Strength(1)	Controls(2)	% Control Efficiency	Controlled Source Strength	Comments
C1 belt to screen	1	N	0%	1	Already enclosed
Screen to standard crushers	1	N	0%	1	Already enclosed
Screen to C2 belt	3	V,H,S	90%(3)	0.3	Upgrade existing hooding
Screen to belt C6	4	V	28%(4)	2.9	Increase ventil. vol. 28%
Standard crusher to belt C2	3	V,H,S	90%(3)	0.3	Upgrade existing hooding
C2 to C3 belt transfer	3	S	90%(3)	0.3	Existing hooding
C5 tripper to surge bin	4	S1	90%	0.4	
Surge bin to screen feeders	1	N	0%	1	
Feeder belt to screens	2	V	50%(4)	1	Increase ventil. vol. 50%
Screen to short-head crushers	2	V	50%(4)	1	Increase ventil. vol. 50%
Screen to C7 belt	4	V	50%(4)	2	Increase ventil. vol. 50%

TABLE 7.4 (Cont'd)

Source Description	Strength(1)	Controls(2)	% Control Efficiency	Controlled Source Strength	Comments
Shorthead to C2 belt	3	V,S	90%	0.3	Existing enclosure
C7 belt to C8 belt	4	S	90%(3)	0.4	Existing hooding
C6 belt to C8 belt	4	S	90%(3)	0.4	Existing hooding
C8 belt to C9 belt	1	N	0%	1	
Re-entrainment	10	Ds,WW,Vac	90%	1	
	50			14.3	Net decrease of 71.4%

Footnotes:

(1) Source strength on scale of 1 to 10, with 1 being negligible and 10 being significant source.

(2) V - increased local exhaust ventilation
H - hooding/enclosure modifications
S - water sprays installed
Ds - chemical dust suppressant
WW - water wash down
Vac - vacuum truck used inside building
Sl - dust seal
N - no change

(3) From Fugitive Emissions and Controls, p. 79. Hooding/enclosure plus sprays are 90% efficient.

(4) From ASARCO Glover lead SIP documents (attached as Appendix K) showing control efficiency directly proportional to ventilation volume.

TABLE 7.5

Ray Unit Crushing Plant
Transfer House
Fugitive Emission Sources and Controls

Source Description	Controls[1]	% Control Efficiency[2]	Comments
No. 3 to No. 4 belt transfer, and No. 4 to No. 5 belt transfer	V,H,S,Vac	93%[3]	Local exhaust ventilation system volume increased 25% and scrubber efficiency increased by 90%

Footnotes:

(1) V - local exhaust ventilation system volume upgraded
H - hooding upgraded
S - sprays installed
Vac - Vacuum truck (used on floor of transfer house)

(2) From Fugitive Emissions and Controls, p. 79. Hooding/enclosure plus sprays are 90% efficient.

From ASARCO Glover Plant Lead SIP documents (attached as Appendix K) showing efficiency directly proportional to ventilation volume.

(3) The combined efficiency becomes:

$$[1.0-(1.0-0.9)(1.0-0.25)] \times 100 = 93\%$$

Table 7.6

Net Decrease in Fugitive Emissions Impact of Ray Unit Crushing Plant

Structure	1990 without Controls ($\mu g/m^3$)	Emission Decrease (%)	1990 with Controls ($\mu g/m^3$)
Track Hopper	11.3	78.8	2.4
Crusher Building	56.5	71.3	16.2
Transfer House	158.1	93.0	11.1
TOTAL	225.9	(Net) 86.9	29.7

7.1.4.1 Stack Sources

The point sources at the Ray Unit crushing plant will be controlled at 99.73% efficiency to achieve compliance with a 0.05 gr/dscf standard (A.A.C. R18-2-801.38) and a 94.6% reduction in emissions. Removal efficiencies, however, are somewhat impractical as emission limitations because they require simultaneous inlet and outlet testing. Most of the scrubber inlet ducts at the Ray Unit crushing plant are not readily accessible to inlet testing. Therefore, a removal efficiency will instead be set by operating conditions specifying an allowable grain-loading (0.05 gr/dscf) that reflects a 99.73% removal efficiency.

ASARCO's operating permit will indicate that each dust collector will be required to comply with a 0.05 gr/dscf emission standard as measured using EPA-approved reference methods as contained in the Arizona Testing Manual. This 0.05 gr/dscf limit equates to 99.73% control efficiency.

As discussed in Section 7.1.3.1 above, the conversion of efficiencies to outlet grain-loadings depends on inlet grain-loadings. Tests conducted at the inlets to scrubber stations 1 & 4 in February of 1988 found an average inlet grain-loading of 18.4 gr/dscf. A 99.73% reduction (i.e., a 99.73% efficient control device) would therefore be required to comply with a 0.05 gr/dscf outlet standard.

The dust collector replacement requirement also will be reflected in an operating permit condition requiring ASARCO to comply with the provisions of this plan, including the replacement schedule described generally in Section 7.1.2.1 and specifically in Table 8.3A.

7.1.4.2 Fugitive Dust Sources

The fugitive dust control strategy will require further hooding at critical locations and use of water sprays at others. These requirements will be contained in ASARCO's operating permit, which will be issued during the calendar year 1989.

7.2 UNPAVED ROADS

7.2.1 DESCRIPTION OF SOURCE CATEGORY

Engineering-Science separated unpaved roads and lots into two categories, apparently for administrative convenience: (1) those owned by the Town of Hayden, and (2) those owned by ASARCO. Engineering-Science's description of the ownership, location, and even names of the roads, however, is neither accurate nor necessary. For example, the two unpaved roads attributed to ASARCO ownership are Kennecott and Canyon Roads. The road officially denominated as "Canyon Road", however, is already paved and is owned by the Town of Hayden. Engineering-Science was actually referring to the road that runs from the crusher building

to the concentrator area, which is sometimes also referred to as Canyon Drive. Both this road and Kennecott Road are owned by ASARCO.

No real reason is given for segregating unpaved roads into two source categories. Even though prior discussions (sections 1 through 6) utilized the distinction made in the Demonstration SIP, for the purposes of control strategy development, all significantly traveled unpaved roads are treated as one category. Those roads are identified in Figure 7.3. Other roads in the Hayden area are either already paved or are back alleys that receive little traffic.

The category also includes dust from significantly disturbed plant yards. The two suspected sources in this category are the concentrate storage and bedding areas near the Hayden smelter, which are shown in Figure 7.4. These storage piles experience considerable disturbances from front-end loaders and other traffic.

In all, the road and plant yard fugitive dust category was determined by ISC modeling to contribute 86.5 $\mu g/m^3$ (80.7 + 5.8 $\mu g/m^3$) to the 24-hour design concentration of ~~677~~ 630 $\mu g/m^3$, and 11.1 $\mu g/m^3$ (8.8 + 2.3 $\mu g/m^3$) to the annual design concentration of ~~110.9~~ 104.2 $\mu g/m^3$. Thus, significantly traveled unpaved roads and lots together account for a modeled ~~12.8%~~ 13.7% of the 24-hour and 10% of the annual design concentrations.

7.2.2 PROPOSED CONTROL STRATEGY

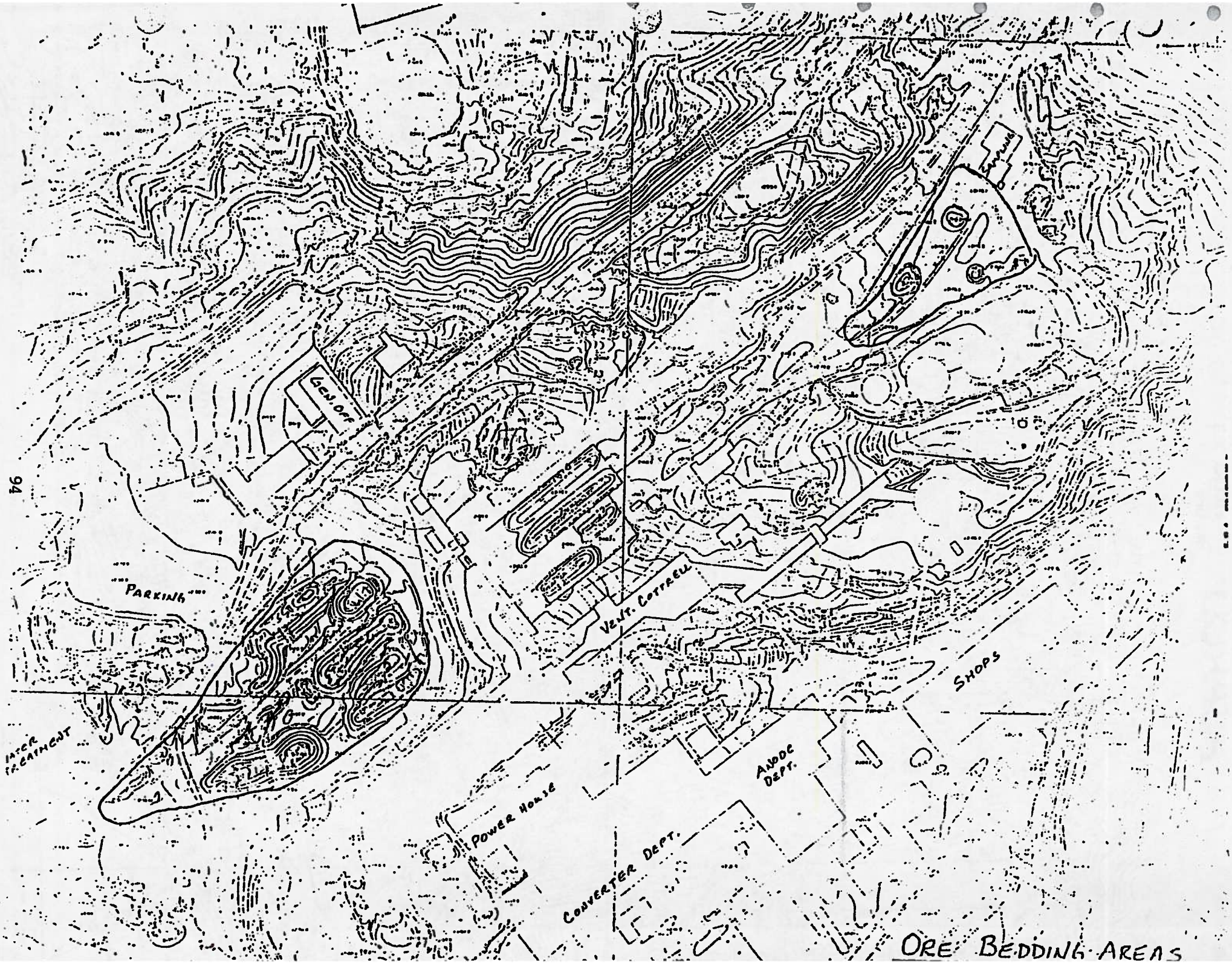
Engineering-Science recommends the paving of all of significantly traveled unpaved roads and lots. This SIP requires the use of surfactants instead of paving in most areas. Most of the Hayden unpaved traffic routes are characterized by low volume, and traveled mostly by heavy and/or tracked vehicles. Therefore, paving is not a cost-effective option: Paving "is expensive and is probably most applicable to high volume (more than a few hundred passes per day) public roads and industrial plant roads that are not subject to very heavy vehicles (e.g., slag pot carriers, haul trucks, etc.) . .." U.S. EPA, Control of Open Fugitive Dust Sources, p. 3-6 (EPA-450/3-88-008, Sept. 1988). Also, some of the Hayden-area roads, especially Canyon Drive, have poorly constructed bases which make paving impractical. "[B]ecause of the additional maintenance costs associated with a paved road under these service environments, emissions from these roads are usually controlled by regular applications of water or chemical dust suppressants." Id., p. 3-1.

The lower cost of surfactants will allow a larger number of area sources to be controlled. As discussed further in Section 7.2.3, proper application of surfactants can achieve results comparable to paving.

ASARCO

FIGURE 7.3
Ray Unit

UNPAVED ROADS



ORE BEDDING AREAS

Areas in which front-end loaders are used are not amenable to surfactant controls. Thus, ASARCO will pave the storage areas included in this source category: (1) the concentrate storage area near the sampling building at the Hayden Plant, and (2) the main concentrate storage area at the Hayden Plant. See Figure 7.4. This paving program will be completed by 1991.

7.2.3 DEMONSTRATION OF EFFECTIVENESS

Summarizing the foregoing control measure descriptions, ASARCO will be required to treat all of the roads shown in Figure 7.3 and to pave the storage areas shown in 7.4. These measures will result in a 90% reduction in emissions from the "unpaved road" source category. The net effect of this percentage reduction on the 24-hour and annual design concentrations is shown in Tables 8.1 and 8.2.

7.2.4 MEANS OF IMPLEMENTATION

The road dust and storage area control measures will be implemented by conditions set forth in ASARCO's operating permit, to be issued within calendar year 1989.

7.3 PAVED ROADS

7.3.1 DESCRIPTION OF SOURCE CATEGORY

Most of the major streets in the Hayden area are paved, but not curbed. The re-entrained dust washed onto these paved roads contributes 29.6 $\mu g/m^3$ (~~4.4~~ 4.6%) to the 1990 24-hour design concentration of ~~677~~ 630 $\mu g/m^3$. See Table 7.1. This source category also is estimated to contribute 3.3 $\mu g/m^3$ (~~3~~ 3.2%) to the 1990 AAM design concentration of ~~110.9~~ 104.2 $\mu g/m^3$. See Table 7.2.

7.3.2 PROPOSED CONTROL STRATEGY

Engineering-Science recommends the addition of curbing to the paved roads identified in Section 7.3.1. This control program, however, will not be necessary. As shown in Tables 8.1 and 8.2, other measures in this SIP will suffice to attain the PM_{10} NAAQS. Therefore, the expense of curbing is not justified.

7.3.3 MEANS OF IMPLEMENTATION

Following the implementation of this plan, if violations of the PM_{10} NAAQS are recorded, this SIP has to be re-evaluated. See Section 12.0. At that time, the State will consult appropriate local authorities concerning the curbing of paved roads within the Town of Hayden.

7.4 LOCOMOTIVES

7.4.1 DESCRIPTION OF SOURCE CATEGORY

This source contributes ~~64.7~~ 58.8 $\mu g/m^3$ (~~9.6~~ 9.3%) of the 1990 24-hour design concentration of ~~677~~ 630 $\mu g/m^3$ to locomotive emissions. This source category consists primarily of rolling stock owned by the Copper Basin Railway Company (about 45% owned by ASARCO). This line serves the needs of the copper processing activities in the Hayden area.

The railway's main functions are transport of ore from the Ray mine to the Ray Unit crushing plant and the transport of concentrate from the Ray mill to the Hayden smelter. Five to six trains per day, with three locomotives each, make the mine-mill run. The Copper Basin line also transports freight, copper anodes and sulfuric acid out of the Hayden area to another trunk line, usually running one train per day. The diesel locomotives generate particulate emissions primarily by incomplete combustion.

7.4.2 PROPOSED CONTROL STRATEGY

Engineering-Science recommended alternative maintenance procedures to cut emissions from this source category by 60%. This SIP will require this maintenance through imposing a 40% opacity limitation on visible emissions.

7.4.3 DEMONSTRATION OF EFFECTIVENESS

The effects of a 60% decrease in locomotive emissions on the 24-hour and annual design concentrations are shown in Tables 8.1 and 8.2.

7.4.4 MEANS OF IMPLEMENTATION

The 40% opacity limit will be mandated by revisions to the Arizona Administrative Code (R18-2-602). Proposed regulations are included in Appendix J.

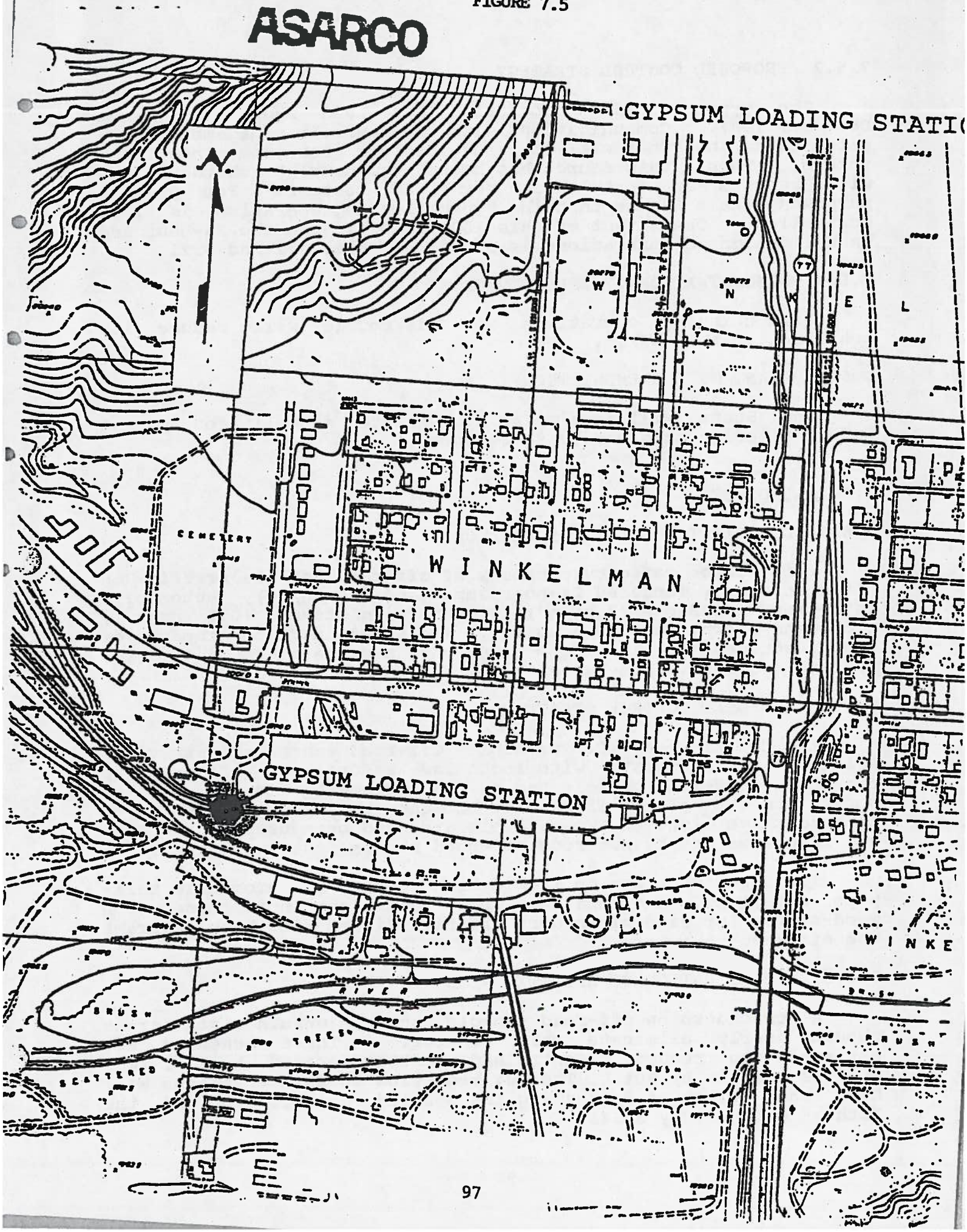
Following the implementation of this plan, if violations of PM_{10} NAAQS are recorded, this SIP has to be re-evaluated. At that time, the state will adopt a revised locomotive rule which would require the installation of vane-type spark arrestors on each heavy duty locomotive to achieve much greater control.

7.5 GYPSUM PLANT

7.5.1 DESCRIPTION OF SOURCE CATEGORY

This source is a train loading station associated with a gypsum quarrying operation. See Figure 7.5. The 1990 impact of this source is estimated to be 10.2 $\mu g/m^3$ (24-hour average). See Table 7.1.

FIGURE 7.5


ASARCO
GYPSUM LOADING STATI
N
CEMETERY
WINKELMAN
GYPSUM LOADING STATION
WINKE
RIVER
BRUSH
TREES
SCATTERED
BRUSH

7.5.2 PROPOSED CONTROL STRATEGY

The gypsum loading operation has been shut down since December 1987. Communications with the source's management indicate that the owner will use truck haulage for the indefinite future. Thus, this source has been "permanently" shutdown and will require an installation permit to restart. For present purposes, this means that the gypsum loading operation is 100% controlled. The effect of this 100% reduction on the 24-hour and annual design concentrations is shown in Tables 8.1 and 8.2.

7.5.3 DEMONSTRATION OF EFFECTIVENESS

Discontinuing operations at this source will reduce its contribution to 0 $\mu g/m^3$.

7.5.4 MEANS OF IMPLEMENTATION

The State will require an appropriate installation permit before allowing this source to restart.

7.6 ALL OTHERS

7.6.1 DESCRIPTION OF SOURCE CATEGORY

This source category consists of off-road vehicle traffic on plant property (modeled 24-hour impact of 7.2 $\mu g/m^3$), automobile tail-pipe emissions (7 $\mu g/m^3$), wood-burning stoves (0.1 $\mu g/m^3$), and wind-blown dust (3.3 $\mu g/m^3$). The total modeled impact of these sources is 17.8 $\mu g/m^3$ (24-hour average) and 4.8 $\mu g/m^3$ (annual average). See Tables 7.1 & 7.2.

7.6.2 PROPOSED CONTROL STRATEGY

A.A.C. R18-2-404.C. prohibits Off-road vehicular activity. ASARCO will cooperate with local law enforcement officers to prosecute off-road vehicle use on plant property and has blocked access to an old tailings area between the southern part of Kennecott Ave. and the Town. This area had been used as a short-cut into Town and by numerous off-road recreational vehicles.

The Department can do little with respect to automobile tail-pipe emissions, and neither those emissions nor those from wood-stoves or wind-blown dust are significant enough to warrant the efforts.

7.6.3 DEMONSTRATION OF EFFECTIVENESS

A crackdown on off-road vehicle users in unauthorized areas should nearly eliminate this "source." These measures are estimated to reduce re-entrained dust generated by off-road vehicle traffic by 90%. The 90% reduction in dust emissions will have the effect of decreasing the modeled contribution of the "other" category by 36.4%:

$$\frac{7.2\ \mu g/m^3}{17.8\ \mu g/m^3} \times 90\% = 36.4\%$$

7.6.4 MEANS OF IMPLEMENTATION

ASARCO's commitment to prosecute unauthorized off-road vehicle use is evidenced by the letter attached as Appendix L. The gates and berms blocking access to the tailings area near the Town were in place as of August 12, 1988.

7.7 MINERAL TAILINGS

In the course of reconciliation of receptor and dispersion modeling results, it was concluded that mineral tailings do not contribute to PM_{10} loadings in the Hayden area, significantly. Although the receptor model attributed 5.29 $\mu g/m^3$ (5.1%) of the 104.51 $\mu g/m^3$ (24-hour average) measured at the Garfield site to tailings dust, the ISC model eventually selected found no tailings contributions. See Table 4.2.

Nonetheless, since windblown tailings occasionally generate citizen complaints, ADEQ will include appropriate conditions in the ASARCO's operating permit to assure continued prevention of nuisance dust from this source. Those measures are reported here to provide additional assurances that the PM_{10} NAAQS will be attained and to fully describe the entire control regime.

7.7.1 DESCRIPTION OF SOURCE CATEGORY

ASARCO operates three separate tailings ponds in the Hayden area (the AB, BC, and D ponds). These ponds receive tailings slurry generated at the Ray mill. The ponds, and the roads that surround them, are shown in Figure 7.6.

7.7.2 PROPOSED CONTROL STRATEGY

ASARCO will undertake additional measures to control dust generated at the tailings areas. These controls involve actively traveled roads around the tailings ponds, as well as work practices affecting wind-blown dust off the ponds themselves.

7.7.2.1 Active Roads At The Tailings Dams

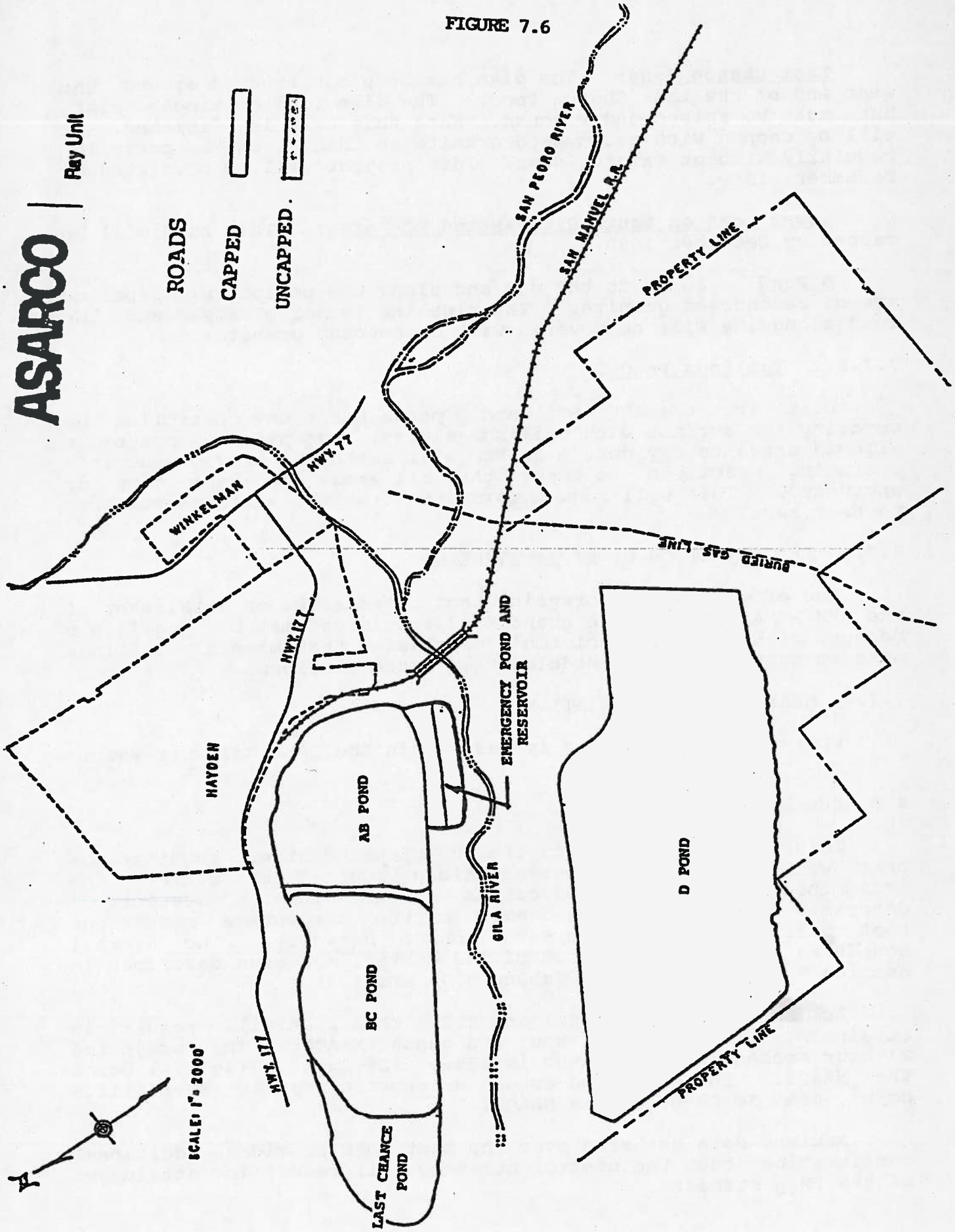
Roads around the tailings ponds (shown in Figure 7.6) have been or will be capped with decomposed granite according to the following schedule:

AB Pond: Approaches to the pond and all peripheral pipeline roads have been capped with decomposed granite since June 20, 1988. The causeway out to the tower in the center of AB pond was capped on March 15, 1988.

BC Pond: The roads in question are from the northeast corner leading west and from the southeast corner leading west. These roads were capped on June 30, 1988. In addition, the road to the pipefitter's repair shack on the north face of BC pond, which receives limited travel, will be capped by December 1989. The peripheral pipeline will be raised, and when it is, a new road around the entire pond will have to be built and covered. The estimated completion date is December 1989.

Emergency Pond and Reservoir: The berm road around the south and east ends were capped in July, 1988.

FIGURE 7.6


ASARCO
Ray Unit
ROADS
CAPPED
UNCAPPED
SAN PEDRO RIVER
SAN MANUEL R.R.
PROPERTY LINE
WINKELMAN
HWY. 77
BURIED GAS LINE
HWY. 177
EMERGENCY POND AND RESERVOIR
HAYDEN
AB POND
GILA RIVER
D POND
BC POND
HWY. 177
PROPERTY LINE
SCALE: 1" = 2000'
LAST CHANCE POND

Last Chance Pond: The dike has been constructed around the west end of the Last Chance Pond. The dike road continues east, but must be raised and widened. When this berm is finished, it will be capped with decomposed granite so that it can be patrolled regularly without raising dust. This project will be completed by December, 1989.

Lower Road on South Side AB and BC Ponds: This road will be capped by December 1989.

D Pond: Roads to the dam and along the peripheral pipeline are of decomposed granite. The pipeline is being raised and the road alongside will be covered with decomposed granite.

7.7.2.2 Tailings Ponds

Dust from the AB, BC, and D ponds has been controlled by covering the surface with tailings slurry, but previous practices allowed areas to dry out. ASARCO will amend the previous owner's operating practices to ensure that all areas are kept damp or encrusted. This will reduce emissions from the tailings surfaces to near zero.

7.7.3 DEMONSTRATION OF EFFECTIVENESS

The effect of the foregoing control measures on attainment of the PM_{10} NAAQS cannot be quantified and indeed may be negligible because of Engineering-Science's conclusion that mineral tailings make no contribution to modeled PM_{10} concentrations.

7.7.4 MEANS OF IMPLEMENTATION

Operating permit to be issued within the 1989 calendar year.

8.0 SUMMARY

This draft SIP outlines the additional control requirements that will be imposed on responsible sources to achieve the recommended percentage reductions in emissions. Section 7 describes those controls and explains the percentage reductions that will be achieved in each source category. The overall schedules for installing each of the control measures described in Section 7 are presented in Tables 8.3A and 8.3B.

As shown in Tables 8.1 and 8.2, this plan will result in attainment of both the 24-hour and annual NAAQS. The projected 24-hour concentration in 1990 is ~~135.4~~ 129 $\mu g/m^3$, ~~10%~~ 14% below the NAAQS. The projected annual arithmetic mean is ~~32.5~~ 31.6 $\mu g/m^3$, ~~35%~~ 36.8% below the NAAQS.

Ambient data gathered over the past year provides additional confirmation that the control strategy will result in attainment of the PM_{10} standard.

Table 8.1

Demonstration of Attainment
of 24-hour NAAQS

Source		1990 (Before Controls), µg/m3		% Reduction		1990 (After Controls) µg/m3
Ore Unloading, Crushing and Conveying		410.8		90.4		39.6
o Fugitive	225.9		86.9		29.6	
o Process	184.9		94.6		10.0	
Unpaved Roads		86.5		90.0		8.7
Paved Roads		29.9		0.0		29.9
Locomotives		58.8		60.0		23.5
Gypsum		10.2		100.0		0.0
All Others		17.8		36.4		11.3
Background		16.0		0.0		16.0
Total		630.0		80.0		129.0
NAAQS						150.0

Table 8.2

Demonstration of Attainment
of Annual NAAQS

Source		1990 (Before Controls), µg/m3	% Reduction		1990 (After Controls) µg/m3
Ore Unloading, Crushing and Conveying		61.7	90.4		5.9
o Fugitive	33.9	86.9		4.4	
o Process	27.8	94.6		1.5	
Unpaved Roads		11.1	90.0		1.1
Paved Roads		3.3	0.0		3.3
Locomotives		5.4	60.0		2.2
Gypsum		1.9	100.0		0.0
All Others		4.8	36.4		3.1
Background		16.0	0.0		16.0
Total		104.2	70.0		31.6
NAAQS					50.0

Table 8.3A

ASARCO - Ray Unit Dust Collector Installation Plan

PROJECT	START DATE	FINISH DATE
Purchase (2) type W-102 & (3) type W-114 Ducons		
Transfer house/track hopper-design foundation/support		
Transfer house-design duct work		
Transfer house-design sump/pipe		
Transfer house-design water pipe		
Design substation		
Design sumps-pump-pipe-foundation		
Purchase electrical 102 Ducons		
Track hopper-purchase ductwork		
Crusher-purchase/install ductwork		
Transfer house-pour/set foundation		
Purchase steel support-102 Ducons		
Transfer house-purchase ductwork		
Transfer house-install slurry pipe		
Transfer house-fabricate sump		
Track hopper-purchase transition duct		
Design structure/foundation 114 Ducons		
Install general water supply		
Purchase substation electrical		
Purchase sump pump		
Purchase sump electrical control		
Purchase sump piping		
Fabricate central sump		
Purchase electrical-114 Ducons		
Crusher-purchase transition ductwork		
Purchase steel support-114 Ducons		
Transfer house-install steel support		
Track hopper-pour/set foundation		
Transfer house-install 102 Ducon		
Transfer house-install ductwork		
Track hopper-install electrical		
Track hopper-install ductwork		
Track hopper-install steel support		
Track hopper-install 102 Ducon		
Crusher-install sump electrical system		
Install substation conduit		
Install sump piping		
Install substation		
Install sump and pump		
Crusher-pour/set foundation-No. 1 (114)		
Crusher-electrical for No. 1 (114)		
Crusher-remove No. 1 rotoclone		
Crusher-remove No. 4 rotoclone		
Crusher-steel structure No. 1-114 Ducon		
Crusher-reinstall No. 1 rotoclone as No. 4		
Crusher-pour/set foundation-No. 2 (114)		
Crusher-install No. 1-114 Ducon		
Crusher-electrical for No. 2 (114)		
Crusher-steel structure No. 2-114 Ducon		
Crusher-pour/set foundation No. 5 (114)		
Crusher-install No. 2-114 Ducon		
Crusher-steel structure for No. 5 (114)		
Crusher-electrical for No. 5 (114)		
Crusher-install No. 5-114 Ducon		

Table 8.3B

ASARCO - Ray Unit

Dust Control Action Plan

Project	Start Date	Finish Date
AB Pond-cap related roads		
BC Pond NE&SE-cap related roads		
BC shortrun-cap related roads		
Track hopper south side sprays		
Install 4 belt hood		
Install 405 transfer hood		
Track hopper north side sprays		
Install 2 belt sprays		
Install 2-3 transfer sprays		
Install 3-4 transfer sprays		
Install 4-5 transfer sprays		
Track hopper center sprays		
Cap road around emergency pond		
Install 2 belt hood		
Install 6-7 discharge sprays		
AB/BC Ponds-Cap related roads south face		
BC Pond-cap north face roads		
O Pond-cap related roads		
Last Chance Pond-cap roads		
S tripper-install dust seal		
BC Pond-cap new lift road		

Dust Suppressant Road Work	Date
ASARCO Canyon Road (Dust Ban)	
ASARCO mill road loop (Dust Ban)	
ASARCO lime/filter plant road (Dust Ban)	
Kennecott Avenue (Dust Ban)	
Gate/berm old tailings road	

9.0 RELATED ISSUES

9.1 AMBIENT MONITORING

The State will conduct ambient PM_{10} sampling consistent with 40 C.F.R. Part 58 to monitor the effectiveness of the control strategy.

10.0 Preconstruction Review

All new major sources and modifications to existing major sources in Arizona are subjected to state requirements for preconstruction review and permitting (See A.A.C., Title 18, Chapter 2, Articles 1, 2 and 3). The State Prevention of Significant Deterioration (PSD) program was conditionally approved by EPA in 1982, and is undergoing revision at this time in order to acquire full approval.

PM_{10} PSD requirements for Arizona were not established at the time this report was drafted. This was due to unavailability of PM_{10} increments at the federal level. Upon promulgation by EPA and within a reasonable time thereafter, the State will adopt necessary rules in order to have a PM10 PSD program which meets the requirements of the Part 52 PSD regulations.

11.0 Demonstration of NAAQS Maintenance through 1997

~~Tables 11.1 and 11.2 show the projected emissions growth for 1997, which was estimated as a result of an increase in emissions from traffic (20 percent), "other sources" (10 percent) and the background concentration (10 percent). All other sources remained at 1990 levels. The emissions increase was based on 1990 air quality following control strategy implementation. The tables demonstrate that the control strategy is sufficient to maintain the NAAQS through 1997.~~ Table 11.1 shows the projected emissions growth for 1997, which was estimated based on the addition of new facilities at the Ray Plant (causing a 25 percent increase in the ore unloading, crushing, and conveying) and restarting the Ray smelter (additional 0.8 micrograms per cubic meter). Also as a result of the new activities, emissions from traffic, locomotive, and "all others" are increased by 10 percent. The emission increase was based on the 1990 air quality following control strategy implementation. The table demonstrates that the control strategy is sufficient to maintain the NAAQS through 1997.

11.1 Contingency Plan

This plan has demonstrated the attainment and maintenance of PM_{10} NAAQS through 1997. Ambient monitoring will be the final proof for such an attainment. The State commits to re-evaluate this SIP if ambient PM_{10} concentrations after the implementation of this plan exceed that of NAAQS.

Some PM_{10} control strategies that are reserved for future consideration are:

a) curbing the paved roads in the Hayden area;
b) requirement for installation of vane-type spark arrestors for locomotives; and
c) further controls on the ore crusher, in case of improvement in available technology.

These measures will be implemented through revisions to the Arizona Administrative Codes and negotiation with responsible sources. For Further requirements <u>see</u> Section 12.0.

12.0 Reasonable Further Progress Report

On an annual basis, the State will evaluate and demonstrate its progress in reaching the goal of attainment and maintenance of the PM_{10} NAAQS through 1997. This will be achieved by the State by providing the following information in the form of an Annual Progress Report.

The first Annual Progress Report is due to EPA, Region 9, six months after the first full calendar year of implementation. The subsequent annual reports are due six months after the end of the calendar year.

For each control measure the State has committed to implement in the PM_{10} SIP, the annual report will include:

a) the names of each source affected;

b) the current status of implementation of the control measure; This will include summarized information on the regulation development (if regulation revision was necessary), negotiation with the sources and/or municipalities affected, project financing, engineering design and/or construction progress for the year, as appropriate.

c) planned versus actual implementation and/or adoption dates of the control measure and/or regulation;

d) planned versus actual effectiveness of the control measure;

e) planned versus actual decrease/increase in contribution to ambient concentration;

f) planned versus actual effect that area growth has had on the emissions reductions;

g) short explanation of shortfalls, where applicable; if shortfalls have occurred, the State will include a plan to develop a contingency plan or SIP revision which would be necessary to attain or maintain the NAAQS.

Table 11.1

Demonstration of Attainment of PM10 Standards in 1997 After Implementation of Controls

Source	24-Hour µg/m3		Annual µg/m3	
Ore Unloading, Crushing and Conveying		49.5		7.4
o Fugitive	37.0		5.5	
o Process	12.5		1.9	
Ray Smelter and Acid Plant		0.8		0.2
Unpaved Roads		9.6		1.2
Paved Roads		32.9		3.6
Locomotives		25.9		2.4
Gypsum		0.0		0.0
All Others		12.4		3.4
Background		16.0		16.0
Total		147.1		34.2
NAAQS		150.0		50.0

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APPENDIX A

SOURCE APPORTIONMENT
OF SUSPENDED PARTICLES AND TOXIC ELEMENTS
IN HAYDEN, ARIZONA

SOURCE APPORTIONMENT OF SUSPENDED PARTICLES AND TOXIC ELEMENTS IN HAYDEN, ARIZONA

FINAL REPORT

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EXECUTIVE SUMMARY

The primary objective of this study was to quantify the contribution potential sources in the smelting community of Hayden, Arizona, make to suspended particulate arsenic, cadmium, lead, and PM_{10} levels using chemical mass balance receptor modeling methods.

About one hundred ambient fine and coarse particle filter samples were collected at two sites in Hayden from November 22, 1986, through January 30, 1987. Fifty of these filters were selected for elemental analysis and source apportionment on the basis of deposit mass, meteorology, etc. Source profiles were developed by direct source sampling of potential sources in the local airshed and from literature values.

The highest PM_{10} value was 236 $\mu g/m^3$ measured at the Garfield monitoring site. The average PM_{10} mass at this site was 73 ± 49 $\mu g/m^3$, but only 47 ± 28 $\mu g/m^3$ at the Hayden Jail site. Most of the mass was associated with coarse particles. The average fine to coarse particle ratio was 0.43 ± 0.26 and 0.35 ± 0.79 at the two sites. The average concentration of arsenic, cadmium, and lead was 0.094, .005, and 0.20 $\mu g/m^3$ at the Hayden Jail and 0.12, 0.005, and 0.22 $\mu g/m^3$ at the Garfield site.

The two largest contributors to PM_{10} mass were ore dust and road dust which together accounted for almost 80% of the mass at both monitoring sites. Fugitive emissions such as slag skimming and pouring, matte tapping, and secondary converter operations contributed less than 2% of the PM_{10} mass. Ore and road dust, however, contributed less than 10% of the PM_{10} lead, less than 6% of the arsenic, and less than 1% of the cadmium. Almost all of the cadmium, arsenic, and about 80% of the lead came from process fugitive emissions within the smelter.

ACKNOWLEDGEMENTS

The assistance and cooperation of ASARCO and its staff in the collection of source samples, plant operation information, and meteorological data is greatly appreciated. A special thanks is extended to ASARCO staff members John Richardson for his assistance with the collection of source samples, Arlo Peterson for his help in coordinating our activities at ASARCO and for providing the meteorological data, and Tom Aldridge and Gene Corelle for their assistance in obtaining appropriate source samples and plant operation data.

The authors also thank Don Holtz and Tom Peters of Engineering-Science for their assistance with the collection of source samples and many helpful discussions. The assistance of John Hoffman, John Walls, and Jerry Paoli of the State of Arizona Bureau of Air Quality Control in the collection of ambient filter samples is greatly appreciated.

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TABLE OF CONTENTS

		Page
	EXECUTIVE SUMMARY	i
	ACKNOWLEDGEMENTS	ii
	LIST OF FIGURES	iv
	LIST OF TABLES	v
1.0	INTRODUCTION	1
2.0	EXPERIMENTAL	1
	2.1 Source Apportionment Methodology	1
	2.2 Ambient Profile Development	3
	2.3 Source Profile Development	6
3.0	RESULTS AND DISCUSSION	10
	3.1 Suspended Particulate Mass Concentrations	10
	3.2 Ambient Particulate Chemistry	12
	3.3 Elemental Composition of Source Profiles	12
	3.4 Source Impacts	15
4.0	MODEL VALIDATION	19
	4.1 Overview	19
	4.2 Quality of CMB Results	19
	4.3 Meteorological and Site Dependence of Source Contributions	21
	4.4 Particle Size Dependence	22
	4.5 Smelter Operations, Etc.	23
	4.6 Major Source Impacts	25
	4.7 Special Issues	28
5.0	CONCLUSIONS AND RECOMMENDATIONS	29
6.0	REFERENCES	31

APPENDICES

A. CHEMICAL MASS BALANCE SOURCE IMPACT RESULTS AND ELEMENTAL COMPOSITION FROM EPA CMB RECEPTOR MODEL VERSION 5.9

B. ELEMENTAL COMPOSITION SOURCE PROFILES

C. AVERAGE SOURCE CONTRIBUTION TABLES

LIST OF FIGURES

		Page
1.	Schematic Illustration of NEA's All Stainless Steel Segregating Dilution Sampler	32
2.	Diagram of Sampling Time Vs. Converter Blowing	33
3.	Comparison of the Fine Particle Elemental Profiles	34
4.	Comparison of the Coarse Particle Elemental Profiles	35
5.	Comparison of the Chemical Profile of the Fine Fraction	36
6.	Comparison of the Chemical Profiles of the Coarse Fraction	37
7.	Histogram Type Plot of the Ambient Elemental Composition	38
8.	Hayden Jail Site - Average Source Contributions	39
9.	Garfield Site - Average Source Contributions	40

LIST OF TABLES

		Page
1.	Summary of Key Features for Sampling Days Selected for Analysis and Source Apportionment	41
2.	Days Included in Meteorological Regimes and Regime Characteristics	43
3.	Summary of Converter Activity During Sample Run Times	44
4.	Bulk Samples Collected from the ASARCO-Hayden Smelter	45
5.	Summary of Road Dust and Crustal Samples Collected at the Hayden Site	46
6.	Summary of Sampling Data for Process Emissions Collected at the ASARCO-Hayden Copper Smelter	47
7.	Summary of ASARCO-Hayden Resuspension Data	48
8.	Summary of Hayden Aerosol Mass	49
9.	Comparison of Mean Suspended Particulate Mass at Hayden Sampling Sites	53
10.	Average Fine Particle Elemental Composition	54
11.	Average Coarse Particle Elemental Composition	55
12.	Elemental Ratios	56
13.	List of Source Codes, Mnemonics, and Description	57
14.	Source Composition Profiles for Representative Key Sources and Species	59
15.	Source Composition Profiles for Representative Key Sources and Species	60
16.	Fine to Coarse Particle Ratios for Key Sources in the Hayden Airshed	61
17.	Results for CMB Site	62
18.	Average Source Contributions to Major Source Categories	63
19.	Average Percent Source Contributions to PM10 Mass, Lead, Arsenic, and Cadmium Concentrations	64
20.	Average $\mu g/m^3$ Source Contributions to PM10 Mass, Lead, Arsenic, and Cadmium Concentrations	65
21.	Summary of Major Source Impacts and CMB Quality Measures by Meteorological Regime	66
22.	Comparison of Fitting Quality Parameters for Days When Source Samples Were Collected	67

1.0 INTRODUCTION

Hayden, Arizona is a small community located in the arid mountains about 100 miles southeast of Phoenix at the intersection of state highways 177 and 77. It is a copper mining and smeltering town with milling and smeltering operations on nearly all sides of it and a mining operation about eight miles northwest of the town.

Only one of the two smelters is currently operating. It's main operation is located about a quarter mile up on a hillside northeast of state highway 177. The town of Hayden is between the highway and the smelter. A large mill tailings pile is located about a quarter of a mile southwest of the highway. An ore crusher is located next to the highway, and the crushed ore is transported by conveyor belt up the hill to the smelter.

Air quality concerns in this airshed have been for particulate levels and toxic pollutants. The primary objective of this study was to determine the contribution potential sources make to PM_{10} particulate levels as well as species related to health concerns such as As, Cd, and Pb, using chemical mass balance receptor modeling methods.

2.0 EXPERIMENTAL

2.1 Source Apportionment Methodology

The CMB receptor model is based on the conservation of relative aerosol chemistry from the time a chemical species is emitted from its source to the time is is measured at a receptor. That is, if p sources are each emitting M_j mass of particles, then

$$m = \sum_{j=1}^{p} M_j, \qquad (1)$$

where m is the total particulate mass collected on a filter at a receptor site. This assumes the mass deposited on a filter is a linear combination of the mass contributed from each of the sources.

The mass of a specific chemical species, m_i, is given by

$$m_i = \sum_{j=1}^{p} M_{ij} = \sum_{j=1}^{p} F'_{ij} M_j \tag{2}$$

where M_{ij} is the mass of element i from source j and F'_{ij} is the fraction of chemical species i of the mass from source j as collected at the receptor. It is usually assumed that

$$F_{ij} = F'_{ij}, \tag{3}$$

where F_{ij} is the fraction of chemical species i emitted by source j as measured at the source; that is, the relative fraction of chemical species i of the source mass <u>at the receptor</u> is assumed to be the same as the relative fraction of i of the source mass <u>at the source</u>. The degree of validity in this assumption depends on the chemical and physical properties of the species and on its potential for atmospheric, in-transit modifications such as condensation, volatilization, chemical reactions, sedimentation, etc.

Accepting equation (3) as valid and dividing both sides of equation (2) by the total mass of the deposit collected at the receptor site, it follows that

$$\frac{m_i}{m} = \sum_{j=1}^{p} F_{ij} \frac{M_j}{m} \tag{4}$$

or,

$$C_i = \sum_{j=1}^{p} F_{ij} S_j, \tag{5}$$

where C_i is the concentration of the chemical component i as measured at the receptor and S_j is the source contribution (i.e., ratio of the mass contributed from source j to the total mass collected at the receptor site). In practice, it is S_j, the fraction of particulate pollution measured at a receptor due to source j, which is of primary interest in CMB calculations.

If the C_i and the F_{ij} at the receptor for all p of the source types suspected of affecting the receptor are known, and if $p < n$ (n = number of chemical species quantified), a set of n simultaneous equations exists from which the source contribution S_j for each source may be calculated by least squares methods.

NEA used its own quantitative source apportionment system (QSAS III) to perform initial CMB calculations based on an EVLS regression analysis. QSAS III also includes a number of graphics routines which aid in the fitting process and in the presentation of results. The CMB calculations were then repeated with Version 5.9 of the EPA CMB program. The EPA-CMB results are presented in Appendix A.(1,2)

Implementation of a CMB analysis requires the formation of both ambient and source elemental data sets. The development of these data sets for this study are discussed in detail below.

2.2 Ambient Profile Development

2.2.1 Ambient Monitoring Sites

Two ambient monitoring sites separated by about one half mile were used to collect ambient particulate samples. A historical monitoring site located at the Hayden jail southeast of the intersection of Kennecott and Canyon Roads was used as the primary monitoring site where fine (< 2.5 μm), coarse (> 2.5 μm and < 10 mm), PM_{10} (< 10 μm), and TSP samples were collected. A

secondary monitoring site was located at the Hayden City Maintenance Yard on Garfield Avenue a few hundred yards uphill from the ore crusher building. Only fine and coarse particles were collected at the Garfield site.

Fine and coarse particle samples were collected at both monitoring sites using Sierra dichotomous virtual impactor samplers (dichots) with 10 μm inlets. The sampling inlets were located between 15 and 20 feet above ground. Teflon filters were used to collect the fine and coarse particle samples. The coarse particle filters were oil coated.(3)

High volume samplers were used to collect PM_{10} samples on quartz fiber filters and TSP samples on glass fiber filters at the Hayden Jail site.

Two dichot samplers were used at each site to allow twenty-four hour sequential sample collection. The internal consistency of these samplers was established to be better than 4% by simultaneous collocation sampling prior to the sampling period.

2.2.2 Sampling Schedule

All samples collected were twenty-four hour, midnight to midnight samples.

Sampling started on November 28, 1986, and continued through January 31, 1987, at both sites. The high volume TSP and PM_{10} samples were collected on an every sixth day schedule. Dichot samples were collected every third day at both sites from November 28, 1986, to December 7, 1986, and on an every day schedule from January 27, 1987, through January 31, 1987, when source samples were collected at the smelter. During the period from

December 18, 1986, through January 12, 1987, samples were collected at the Hayden Jail site on a schedule of two days on and two days off, while samples were collected every day for three days at the Garfield site with only one day off.

2.2.3 Ambient Filter Selection

Filters were selected for chemical analysis and source apportionment to represent worst case dichot PM_{10} days, as well as days which would represent conditions that might enhance the impacts of specific sources. The selection criteria used are listed below in order of their importance:

- High PM_{10} Values: Filter samples from days with high PM_{10} values were selected to represent worst case days.
- Predominant Wind Direction: Filter samples collected on days when the ambient monitoring sites were either upwind or downwind of the smelter or mill tailing ponds, were selected for analysis to maximize the impacts from these sources, as well as to test other source impact calculations.
- Wind Speed: Filters collected on days with low wind speeds were selected to emphasize fine particle source impacts, and high wind speed days were selected to emphasize sources of wind blown dust.
- Fine to Coarse Ratios: Filters from days with high fine to coarse particle ratios were selected to emphasize source impacts from fine particle sources, and filters from days with low ratios were selected to emphasize source impacts from coarse particle sources.
- Plant Operations: Filters collected on days when the plant was not in full operation were selected to test source impact calculations.
- Day of Week: Filters were selected to represent different days of the week.

- Unusual Events: Filters were selected from days with special meteorological events.

The days and filters selected, their key features, and selection criteria are summarized in Table 1. The meteorological conditions on the fifteen days selected can be grouped into five regimes based on wind speed and direction, as indicated in Table 2. The number of days selected from each regime is generally typical of their historical frequency of occurrence.

The average wind speeds listed are twenty-four hour averages of five monitoring sites operated by the smelter. Although the average wind speeds on the highest wind speed days (Regime 1) were less than 6.3 mph, short term average wind speeds to 24 mph were recorded, and wind speeds in excess of 15 mph accounted for a significant portion of the sampling period.

2.3 Source Profile Development

2.3.1 Overview

Composition profiles representing emissions from sources expected to significantly impact the ambient monitoring sites were developed from literature values and direct characterization of emissions from potential sources located in and around Hayden. Samples representing area fugitive dust and process fugitive emissions were collected and characterized by procedures similar to those used to characterize the ambient aerosol.

2.3.2 Process Fugitive Emissions

2.3.2.1 Secondary Converter

Samples of fugitive emissions from the converters were collected from the secondary hood ducting with NEA's

dilution sampler.(4) Most of the converter emissions are collected by either the primary or secondary hoods and ducted to control devices. It was assumed that the emissions collected by the secondary hoods are representative of the fugitive converter emissions not collected by the hoods.

NEA's model V dilution sampler was used to collect fine (< 2.5 μm) and coarse (2.5-10 μm) particle samples from the secondary hood duct. The model V dilution sampler is illustrated in Figure 1 and consists of an all stainless steel dilution chamber with a 10 μm preseparator cyclone and two dichotomous samplers. The arrangement used in this study contained only one dichotomous sampler with Teflon filters. Dilution ratios between 10:1 and 20:1 were typical of this sampling.

Table 3 lists the converter activities during indicated sample collection runs. Figure 2 shows the number of converters blowing during the sampling runs.

2.3.2.2 Matte Tap and Slag Skimming

Samples representing fugitive emissions from matte tapping and slag skimming at the flash furnace were collected from the furnace vent duct using a modification of the dilution sampler shown in Figure 1. In this case, the emissions were close to ambient temperature and already diluted, so only minimal additional dilution was required. A two inch diameter stainless steel probe was used to extract a sample from the ducting. The extracted emissions were drawn into the four inch diameter dilution chamber and then into an eight inch diameter sampling chamber where samples were collected with a dichotomous sampler. The dichotomous sampler used a 10 μm inlet with its weather protector removed.

Although the same ducting was used to collect both the matte tapping and slag skimming emissions, the processes are typically not done at the same time. This allowed the collection of emissions from each separate process as well as a mixture of the two emissions.

2.3.2.3 Slag Pour

Samples of fugitive emissions from the slag pour operation were obtained using a modified version of the NEA dilution sampler. The sampler was set-up downwind of a pre-arranged pouring location so that the wind blown cloud of emissions would surround the sampling probe inlet. A five foot high berm of crushed slag shielded the dilution sampler from the radiant heat released during the molten slag pouring operation.

A ten foot long stainless steel probe (2 inches in diameter) was extended over the berm into the pour area which ducted the emissions into the 4 inch diameter residence chamber and then to the 8 inch diameter sampling chamber with its modified PM_{10} dichotomous sampler.

In order to minimize the influence of the ambient air, the sampler was turned on just a few seconds prior to the slag pour. The sampler was then shut off as soon as the cloud of emissions dissipated. The sample collection period lasted for only about 2 or 3 minutes per slag pour event.

Each sample pair contains emissions from two consecutive slag pours which occurred approximately 15 minutes apart.

All components in the sampling system were cleaned with ethanol between each sampling location; furnace vent, secondary converter, and slag pour.

2.3.2.4 Ore Crusher

An ambient dichotomous sampler was positioned on the top level inside the ASARCO ore crusher, approximately ten feet from the roof. Samples of the entrained dust were collected in the morning and once again in the afternoon. The ore crusher was operating at a normal level during both time periods. A grab sample of the settled dust was also collected and resuspended in the laboratory.

2.3.3 Smelter Road and Area Dust

Five bulk road and yard dust samples from major traffic areas within the smelter complex were collected. Representative bulk samples of other fugitive dust were collected from sites where activity from heavy machinery or high winds would entrain dust. The samples collected are listed in Table 4. Samples 4-8 were composited and analyzed as a single sample. Samples 1, 3, and 9 were not analyzed because of limited resources.

The individual bulk dust samples were sieved through a 40 mesh screen, composited, and then sieved through a 400 mesh screen. The composited sample was then aerosolized in NEA's laboratory resuspension chamber and sampled using a dichotomous sampler with a standard 10 μm inlet.

2.3.4 Passive Area Fugitive Dust Emissions

Bulk dust samples of passive fugitive dust sources such as wind blown mill tailing pond dust, soil and road dust, and traffic generated paved and unpaved road dust were collected, aerosolized in the laboratory, and the resulting dust sampled using a dichotomous sampler with a 10 μm inlet similar to the ambient samplers. The fugitive dust samples collected near the jailhouse ambient monitoring site and the ore tailings are listed in Table 5. Sample 3 was not analyzed.

2.3.5 Selection of Filter Samples for Analysis

Filter samples collected from sources of fugitive emissions are listed in Tables 6 and 7. Only nineteen of the process fugitive emission filters were selected for analysis as indicated by asterisks in Table 6. The criteria for selection included optimum deposit mass, uniformity of deposit, duration of sampling, availability of other filters representing the same process and resource limitations. All of the resuspension filters listed in Table 7 were analyzed.

3.0 RESULTS AND DISCUSSION

3.1 Suspended Particulate Mass Concentrations

The fine, coarse, and PM_{10} suspended particulate mass concentrations for the days sampled are listed in Table 8. The mean concentrations and ranges by site and particle size are summarized in Table 9.

The highest PM_{10} value of 236 $\mu g/m^3$ was measured at the Garfield site on December 29, 1986. This excludes the site 1 sample collected on 11/18/86 because of its short sampling interval of only 4 minutes. Although samples were not collected on this day at the Hayden Jail site for comparison, both monitoring sites were operating on the day with the third highest PM_{10} value, January 11, 1987. The PM_{10} on this day was 127 $\mu g/m^3$, substantially lower than the highest PM_{10} value but almost the same as the second highest value of 128 $\mu g/m^3$ measured on January 30, 1987. The PM_{10} value measured at the Hayden Jail site, however, was slightly below average and 3.7 times lower than at the Garfield site that same day. Although the difference between the two sites was only about a factor of two on the second highest PM_{10} day, January 30, 1987, the meteorology was substantially different on this day as compared to the days with the highest and third highest PM_{10} values. The two

highest average wind speeds, 6.2 and 6.6 miles per hour, were recorded on the highest and third highest PM_{10} days. On these two days the wind was generally from the east (79° and 81°) which put the Garfield site downwind of the ore crusher and conveyor belt and the Hayden site upwind of the Kennecott road, the largest individual sources of PM_{10} particles at each site respectively. On the highest PM_{10} day, over 93% of the attributed mass was due to ore dust (DUSTO) from the ore crusher and/or the ore conveyor belt. On the third highest PM_{10} day, over 96% of the attributable PM_{10} mass at the Garfield site was due to the ore crusher and/or ore conveyor and 81% at the Hayden Jail site.

The average PM_{10} value at the Hayden Jail site of 47 $\mu g/m^3$ was substantially lower than the 73 $\mu g/m^3$ measured at the Garfield site. Even though the sampling days included in each monitoring site were not the same, this general trend was representative of the days when simultaneous samples were collected. On the other hand, the average fine particle mass was nearly the same at both sites, 12 $\mu g/m^3$ at the Hayden Jail site and 13 $\mu g/m^3$ at the Garfield site.

The days selected for chemical analysis consisted of about half of the days sampled. The analysis days selected, however, were biased towards high PM_{10} days as indicated by our selection criteria and a comparison of the average mass values listed in Table 9 for sampled and selected days.

The fine to coarse ratios were generally substantially less than 1.0 indicating a preponderance of coarse particles. The fine to coarse ratios were lowest on the high wind speed days and days with highest PM_{10} values, while the highest fine to coarse particle ratios were on the lowest wind speed days.

3.2 Ambient Particulate Chemistry

The average fine and coarse particle elemental compositions are listed in Tables 10 and 11, and key elemental ratios are listed in Table 12. The elemental composition of each individual filter analyzed is presented in Appendix A. The most abundant element in both size fractions was Si, which represented about 20% of the mass. The next most abundant coarse particle element at the Hayden Jail site was Ca followed by Fe and Al, while Fe and Al were the second and third most abundant elements at the Garfield site. Sulfur was the second most abundant fine particle at both sites followed by Al.

Most of the Si is in the coarse particle size fraction, with average fine to coarse particle ratios of 0.26 at the Hayden Jail and 0.14 at the Garfield site. Other elements mostly in the coarse fraction include Al, K, Ca, Ti, Mn, Fe, and Cu. On the other hand, S, Cl, Zn, As, Cd, Sb, and Pb are more abundant in the fine particle size fraction.

The concentration of the three toxic elements, As, Cd, and Pb were generally quite low. Average PM_{10} $\mu g/m^3$ values were nearly the same at both sites and about 0.1, 0.005, and 0.2 $\mu g/m^3$, respectively. The Pb concentration is less than many urban airsheds because of the large contribution from motor vehicle tailpipe emissions in urban airsheds. The As and Cd are substantially higher than urban airsheds but significantly lower than measured in the Ruston-Tacoma airshed where a high As copper smelter operated until recently.(5)

3.3 Elemental Composition of Source Profiles

The potential major sources of PM_{10} and toxic elements in Hayden can be grouped into the following eight general source categories:

- Fugitive area dust sources from wind and traffic
- Ore handling and processing
- Fugitive emissions from the smelting process
- Miscellaneous smelter dust
- Wind-blown dust from ore tailings ponds
- Stack emissions from the smelting process
- Motor vehicle emissions
- Background

Representative source profiles were developed through direct source sampling for the first five categories. Literature composition source profiles were used to represent motor vehicle emissions as well as other miscellaneous sources. Source profiles were not developed to represent emissions from the main stack, acid plant, and bell damper because of limited resources and the fact that these sources had been estimated to have minimal impacts on the local airshed. The background aerosol was not characterized.

Source profiles considered in the CMB source apportionment calculations are listed in Table 13. The source profiles used for the first ten sources listed in Table 13 are from either the EPA source profile library (6) or NEA's master source profile library (7).

The chemical composition of the fine, coarse, and PM_{10} particulate emissions from each of these source categories are listed in Appendix B. The elemental composition of key species for selected sources are listed in Tables 14 and 15. Source profiles for three crustal dust sources (KNECTT, PLNTRD, and ORDUST) and three smelter fugitive emission sources (SSFF1, MTFF1, and 2NDCD3) are listed for contrast and comparison. The first three dust sources are primarily coarse particle sources, while the last three smelter sources are primarily fine particle sources as indicated with the fine to coarse

particle ratios listed in Table 16. The Kennecott road dust is characterized by large particles rich in Al, Si, Ca, and Fe. The composite plant road dust on the other hand is easily distinguished from the Kennecott road dust by its low Ca and high S, Fe, and Cu concentrations, as well as a high Si concentration. The ore dust has the highest concentration of Al and Si, but relatively low concentrations of S, Ca, and Cu. It does, however, have a high and unique K to Ca ratio as well as a high Ti concentration.

The three fugitive smelter source emissions are easily distinguished from the first three sources based on their fine particle characteristics and absence of crustal elements such as Al, Si, Ca, and Ti. The primary elements in these emissions are Zn, As, Cd, Sb, and Pb. Although these three sources are composed of similar major elements, their relative compositions are distinctly different which allows them to be easily resolved. These subtle differences can be more easily recognized by viewing the entire elemental pattern as illustrated in Figures 3-6. Zinc is the most abundant element in the slag skim emissions followed by Pb and As. Arsenic, on the other hand, is the most abundant species in the emissions from the matte tapping process with substantially lower concentrations of Pb and Zn. The other characteristic feature of the matte tap emissions are the high concentrations of Cu and Fe relative to the emissions from the slag skim and secondary converter. The secondary converter emissions are distinguishable from the other two smelter emissions by its high Pb concentration, relatively low As and Zn concentrations, and very low Fe concentration. It is also interesting to note that K is reasonably abundant in the smelter emissions, while the other elements typically associated with crustal material are noticeably absent.

The fine and coarse particle chemistries are generally quite similar. One of the more striking differences, however, is the difference between the coarse and fine particle Si composition for the matte and slag tap emissions. The Si concentration in the fine

particle size fraction for these two sources is less than 0.0005%, while it was 3.9% in the slag tap emissions and 2.2% in the matte tap emissions.

3.4 Source Impacts

3.4.1 Overview

Chemical mass balance source apportionment calculations were performed on fifty ambient particulate filter data sets representing about half of the sampling days in this study. Individual source apportionment results for each filter are presented in Appendix A. Table 17 shows an example of the CMB results presented in Appendix A. In this example, the filter identification numbers for the matching fine and coarse particle filters (715, 714), particle size (coarse), sampling site (Hayden Jail, HD), and sampling date (January 4, 1987) are listed at the top of the page. The CMB modeling performance measures are listed just below this information, (R-SQUARE: .9749, CHI SQUARE: 1.3403), followed by a listing of the fitted sources and their source contributions. In the bottom portion of the table are listed the measured elemental concentrations, their calculated concentrations, and the ratio of the calculated to measured concentrations. Elements actually used in the fitting process are indicated with asterisks.

The CMB results presented in the Appendices represent the best model solution as determined by an iterative procedure which optimizes the following model performance parameters:

- Source contributions should be positive and greater than their uncertainties. The T-statistic value should be greater than 2.0.
- R-square values should be greater than 0.8.
- Reduced chi square should be minimized and generally less than 2. A value greater than 4 indicates that the model has not explained the ambient data well.

- The calculated to measured concentration ratio for individual elements should approach 1.0 within the listed uncertainty.

- The percent elemental mass explained should approach 100% within the uncertainty.

- The degrees of freedom should be maximum, preferably greater than 5.

- Source contribution estimates should approximate the measured mass concentrations.

In the example illustrated in Table 17, 98.098 ± 11.260% of the mass was explained by the sources indicated. A reduced chi square value of 1.3403 was obtained with 8 degrees of freedom (DF). The calculated to measured elemental ratios were generally equal to 1.0 within their listed uncertainties for the fitting elements. The largest deviations from 1.0 were for elements below the analytical detection limit and for abundant elements like Cu which were omitted from the fitting because of the lack of a source capable of explaining the excess copper as discussed in the next section. The R-square value is 0.9749, and the mean TSTAT value is 4.98 with a low value of 3.74.

Figure 7 shows an alternative representation of the same source apportionment results listed in Table 17. The solid line represents the measured ambient elemental concentration. The asterisks indicate calculated elemental concentrations for fitting species used in the CMB regression calculations; the open circles indicate the calculated concentrations for species not used in the least squares fitting process. It is clear from this illustration that Cu, one of the more abundant species, is substantially under-fit. However, it is not possible to fit more of the Cu with the available source profiles. Obviously, a source rich in Cu is missing from the source profiles. Because of this, Cu was not included as a fitting element because it would have tended to over-estimate the contribution of the sources included in the fit.

3.4.2 Average Source Impacts

The average source contributions to suspended fine and coarse particulate mass are illustrated in the pie charts shown in Figures 8 and 9 and listed in Table 18. The average impacts to PM_{10} suspended particulate mass, As, Cd, and Pb concentrations are summarized in Tables 19 and 20. The average source impacts by species, size, and meteorological regime are presented for each site in Appendix C. It should be noted that the average source contributions are listed both as $\mu g/m^3$ and percent. The average percent contribution listed is not the average source contribution listed in $\mu g/m^3$ divided by the average deposit mass times 100%. It is instead the average of the percent source contributions calculated for each individual filter data set included in the average. Although the average percent values calculated by these two methods are similar, the differences in some cases can be substantial.

Ore dust from the ore crusher, conveyor belt, etc., was the largest source of coarse and PM_{10} suspended particulate mass at both the Hayden Jail and Garfield monitoring sites. Kennecott road dust contributed almost as much PM_{10} and coarse particulate mass at the Hayden Jail as ore dust, but over ten times less than the ore dust source at the Garfield site. The only other sources contributing more than 1% of the suspended particulate PM_{10} mass were sources of secondary sulfate and the copper ore tailings pile, both of which contributed about 5% of the particulate mass.

The average source contributions to toxic species such as As, Cd, and Pb are much different from the major sources of particulate mass as indicated in Tables 18-20, as well as the tables in Appendix C. Whereas, road and ore dust were the only major sources of PM_{10} mass, they are relatively minor contributors to the concentration of toxic elements in the airshed. Fugitive emissions from the smelter operation were the primary source of toxic elements which were concentrated primarily in the fine particle size

fraction. The largest source of As, Cd, and Pb at both monitoring sites were fugitive emissions from the secondary converter. Slag tapping and pouring were the second largest sources of Pb and As, and matte tapping was the second largest source of Cd. The major sources of PM_{10} contributed about 5% or less to the three toxic elements.

On days when there were high winds from the east (Regime 1), ore dust (DUSTO and CUOR) was the dominant source of PM_{10} mass at both sites and responsible for about 70% of the mass with about 25% of the mass unexplained. On low wind speed days when the wind was from the south (Regime 2), ore dust was still the largest source of PM_{10} mass at the Garfield site, but Kennecott road was the largest source at the Hayden Jail site. In addition, fine particle sources in general were a much larger fraction of the PM_{10} mass but the absolute contribution of secondary sulfate was only about 30% to 40% greater than on high wind speed days. On days with moderate wind speeds from the southeast (Regime 3), ore dust was the largest source of PM_{10} mass at both sites as it was on Regime 1 days, but on Regime 3 days, with moderate wind speeds, Kennecott road contributed almost as much mass as the ore dust source category. On the one day that represented Regime 4 when the wind was from the west at moderate wind speeds, the major source impact at the Hayden Jail was Kennecott road dust which was responsible for 50% of the PM_{10} mass, four times more than the impact from ore dust. Under this meteorological regime, calcium rich sources (CAO and GYPSU) were responsible for over 15% of the PM_{10} mass at the Hayden Jail site, but only 2% of the mass at the Garfield site.

Secondary sulfate contributed about 3 or 4 $\mu g/m^3$ to PM_{10} particulate mass and was relatively independent of meteorological regime suggesting a regional background source of this species.

4.0 MODEL VALIDATION

4.1 Overview

Chemical mass balance receptor model calculations are performed on individual filter data sets. These calculations yield the most probable source contributions based on ambient and source aerosol chemistry. Because these calculations are generally made independently of meteorological characteristics, plant operating schedules, etc., the validity of the CMB results can be evaluated by comparing them with these independent airshed and source characteristics.

The objective of this section is to evaluate the source apportionment results relative to the complete airshed data base and model evaluation statistics.(2) It needs to be emphasized that this project was nearly completed before the latest version of the EPA-CMB model and documentation was made available. As a result, not all of the suggested model validation steps were possible because of limited time and the limited resources made available by the EPA to conduct this project. It is clear from the results, however, that not all of the source profiles have been characterized nor have the source profile uncertainties been adequately defined by replicate source sampling over an extended period of time. The impact these limitations have on the source contribution results are discussed in the following subsections.

4.2 Quality of CMB Results

The quality of each CMB source apportionment calculation is evaluated on the basis of the percent of total mass explained, R-square, chi square, t-statistic, source uncertainty clusters, elemental ratios, and residuals. The mass explained, R-square, chi square, and elemental ratio values for each CMB calculation are

presented along with the source impact results in Appendix A. The average values are presented in Appendix C by site, particle size, and meteorological regime, and summarized in Table 21.

The total deposit mass was reasonably well explained considering that secondary sources of carbon and nitrate were not included. In addition, a source rich in copper has clearly been omitted. The average unexplained coarse particle mass was only 1% at the Hayden Jail site, but was up to 10% at the Garfield site. The unexplained fine particle mass at both sites averaged about 20%. However, the average R-square value was 0.97 and the lowest value was 0.82, indicating generally good fits with the fitting species used. The reduced chi square values are relatively high averaging 3.8 for fine particles at the Hayden Jail and 3.6 at the Garfield site, and 2.1 and 2.9 respectively for coarse particles. These high chi square values are due primarily to the use of source profile uncertainties that don't reflect the true source profile variability as a function of time or space and/or the omission of one or more sources. (Although replicate samples of some sources were obtained, they were collected only a few hours apart, were for sources making small contributions, and do not represent the full range of potential source variability over several months.)

The source profile uncertainty used was the larger of the standard deviation of the replicate values, the analytical uncertainty, or 10%. The uncertainties for the major elements in the two largest source categories (Kennecott Road and ore dust), however, were only 10% and represented essentially only one sample. Most of the t-statistic values were greater than 2 and generally 4 or greater.

The elemental ratios and residuals for the fitting elements were, for the most part, in the acceptable range, but there were some elements that consistently exhibited poor fits. Most notable was copper, which was removed as a fitting element at the beginning. Other elements which were well above their detection limits but

frequently underexplained (low ratios, high negative residual) included Si, K, Mn, and Fe.

In general, the best quality fits were obtained with filters with deposits collected during meteorological regimes 2 and 3 when the wind speeds were low to moderate and from the south or southeast. This group of thirty-six filters represents almost three fourths of the filters analyzed. The average coarse particle mass explained was 100 ± 2%, and the average fine particle mass explained was 84%. The poorest quality fits were obtained for filters collected during high wind speeds from the east (Regime 1).

Although the quality of the CMB modeling calculations could be improved, primarily through more complete source characterization, the major source contributions are not expected to be significantly different except for the source responsible for the excess Cu and other underexplained species.

4.3 Meteorological and Site Dependence of Source Contributions

The meteorological and site dependence of the calculated source impacts were consistent with the known source-receptor relationships. For example, the average ore dust source contribution to PM_{10} was about three times greater at the Garfield site than at the Hayden Jail as expected from the close proximity of the Garfield site to this source. On the other hand, the average contribution of dust from Kennecott Road that runs behind the west side of the Jail was about four times greater at the Jail than at the Garfield site. In addition, when strong winds were out of the east (Regimes 1 and 5), the Kennecott Road dust contributions were minimal or below detection limits, and the ore dust contributions were high at both sites. The highest ore dust contributions to the coarse particle fraction at site 2 all occurred during regimes when the wind was

from the east or southeast (Regimes 1, 3, and 5), and the contributions were more than double the average contributions during the other two regimes.

The source contributions from Ca rich sources such as lime or gypsum were also significantly higher at the Hayden Jail as expected from the location of an old lime/gypsum facility just up the hill from the Jail. The highest impact from these sources (12.2 $\mu g/m^3$) occurred during Regime 4 at site 1.

Copper ore tailings dust impacted the sites only twice and both times the impacts were at the Garfield site. One of the days was a day when the Hayden Jail sampler was not operating. The two days when the impacts were observed (1/11/87 and 1/12/87) were Regime 1 days with high wind speeds out of the east. On January 11th when samples were collected at both monitoring sites but the tailings dust was observed only at the Garfield site, the total deposit mass at the Garfield site was almost four times greater than at the Hayden Jail suggesting substantial differences in source impacts on this day.

The impact of fine particle sources such as secondary sulfate, transportation, and the smelter fugitive process emissions were quite similar at both sites.

4.4 Particle Size Dependence

The particle size dependence of the source contributions was consistent with the source emissions characteristics. For example, about 90% of the ore, road and tailings dust was apportioned in the coarse particle fraction, and about 95% of the secondary sulfate was apportioned to the fine particle fraction. This latter point is significant since the average fine to coarse S ratio was about 1.2, and much of the coarse particle S was associated with ore dust.

The average transportation impact was small (about 0.2 $\mu g/m^3$) and resolved only in the fine particle fraction.

The contributions from the smelter's process fugitive emissions (slag skimming, matte tap, converter and slag pour) were generally quite small (about 0.8 $\mu g/m^3$). Although only 75% of these source impacts were in the fine particle size fraction, 90% to 95% of the source emissions were in the fine fraction suggesting the possible over estimating of the coarse particle contribution from these source categories.

It should also be noted that the ore dust profile was developed from settled dust collected in the ore crusher building. Thus, the observed low F/C ratio for this source may be perturbed by the enrichment of coarse particles in the settling process.

4.5 Smelter Operations, Etc.

All of the smelter's furnace operations were down for about twelve hours on December 9, 1986, and January 7, 1987. The wind speed on the 7th was the lowest of the days selected, 0.8 mph, and a relatively low 1.4 mph on the 9th. The smelter's process fugitive emissions associated with the slag skimming, matte tapping, and converter contributed only 0.31 and 0.42 $\mu g/m^3$ to PM_{10} on the 9th and 7th respectively, about half of the study average of 0.8.

The days with high fine to coarse ratios were characterized by lower than normal contributions from coarse particle sources rather than increased impacts from fine particle sources which were relatively small contributors and reasonably constant throughout the study period. The source contributions were insensitive to the day of the week and the small amount of rain that occurred on January 30, 1987.

The CMB model results on the three days that overlapped the days when source samples were collected were among the highest quality. The CMB quality parameters for these days are summarized in Table 22. The average R-square value was 0.97 ± 0.01, and the average chi square value was 2.1 ± 0.7. The average fine particle chi square value was 1.7, while the coarse particle chi square value was 2.5. The percent coarse particle mass explained was 100%, and the fine particle mass explained was 83%. The elemental ratios for the fitting elements, excluding S but including Cu, are listed at the bottom of this table. All of the elements except for Mn, Fe, and Cu generally have ratios quite close to 1.0 within their uncertainty. On the other hand, Mn, Fe, and Cu are rarely within one standard deviation of 1.0, and frequently more than 3 or 4 standard deviations from 1.0. Copper is typically more than 6 standard deviations from 1.0.

Poor fitting of Cu in many airsheds is not considered significant because of the potential contribution from the sampler pump motors. The problem is probably more general in urban airsheds, however, because of the large number of potential electrical sources of Cu. In this particular case, the excess Cu is not thought to be due to either of the above sources because of the low population density, good ventilation at the sampling sites, and absence of high volume samplers at the Garfield site.

Source profiles for the fugitive process emissions are based on samples collected on these three days. The significance of this close overlap of ambient and source sampling is most clearly reflected in the excellent quality of the fine particle fits and ratios close to 1.0 for the elements most abundant in the fine particle fugitive dust emissions such as Zn, As, and Pb.

The poorer quality of fit obtained for the coarse particle fraction on these three days is quite likely due to the contribution of other dust sources either not sampled or included in a composite,

or variability in the ore dust emissions from the crusher and/or the conveyor belt. Although a variety of smelter yard dust and enriched ore samples were collected during the last week in January, many of the samples were combined into one composite. In addition, even though samples of dust in the ore crusher building were collected, filter samples collected in the building were invalidated because of material loss in shipment. The bulk dust collected from within the building and later aerosolized in the laboratory represented the accumulation of dust over an extended period of time and was not necessarily representative of the emissions on these three days.

4.6 Major Source Impacts

4.6.1 Ore Dust

Ore dust was the largest contributor to fine, coarse, and PM_{10} particles at both sites. The fine to coarse source contribution ratios were typical of the low fine to coarse particle ratio observed with the source. The impacts calculated for this source are consistent with the spatial relationship of the two receptors relative to the source and the impacts during the five specified meteorological regimes. The largest source of uncertainty in this source contribution estimate is due to the potential variability in the profile for this source and the lack of replicate samples to establish this variability. Another factor which might significantly influence this source's contribution is the possible omission of one or more sources of Cu, Fe, and Mn.

4.6.2 Road Dust

The second largest contributor of PM_{10} and coarse particles was road dust. This source impact, like the ore dust source category, was consistent with particle size, source receptor, and meteorological regime stratification relationships. Similarly, the largest source of error in this source contribution estimate is

due to the limited definition of the variability of the emissions along this road, as well as the potential influence of a missing or inadequately characterized source.

4.6.3 Secondary Sulfate

The secondary sulfate source contribution estimate is based on the assumption that any S not explained by primary sources is secondary sulfate. Even though the fine and coarse particle S ratio was close to 1.0, the apportioned secondary ammonium sulfate was highly concentrated in the fine particle fraction as would be expected by the nature of this source. In addition, the impact from this source was relatively constant and independent of meteorological regime and receptor location which suggests a source related to the background air mass.

4.6.4 Ore Tailings

The copper ore tailing impacts were observed only on the highest wind speed days when gusts approached 24 mph which is consistent with the origin of this dust. This source impact was observed above its detection limit only in the coarse particle fraction and not at the Hayden Jail site.

4.6.5 Lime and Gypsum

The lime and gypsum source contribution estimates were also largely coarse particle impacts. Lime and/or gypsum either is currently being used at the smelter or was in the past. An old lime or gypsum plant or storage area can be seen from the Hayden Jail. The impact was largest at the Jail. It is also likely that some of the material from the old facility on the hill above the Jail has washed down the gully passing behind the Jail enriching the general area with calcium.

4.6.6 Process Fugitive Emissions

This category includes process fugitive emissions from slag skimming, matte tapping, converter operations, and slag pouring. The relative impacts from these sources may vary substantially over a twenty-four hour period, but the individual source impacts are easily resolvable when the impacts are substantially above their detection limits. In this particular study, the impacts were reasonably small and represent only 1-2% of the PM_{10} mass. This source category, however, is responsible for 80 to 100% of the three toxic species Pb, As, and Cd. Although most of the impact from this source category was attributed to the fine particle fraction, the fine to coarse particle source impact ratios were higher than expected from the source profile characteristics. This is thought to be due in part to the poor source signal to noise ratio in the coarse particle size fraction and the potential omission or mis-characterization of a coarse particle source. As a result, it is likely that the coarse particle source contribution estimates for this source category are over stated.

4.6.7 Smelter Yard Dust

This source category, which is also called composite plant road dust (PLNTRD or COMPR), is a mixture of five dust samples collected within the smelter as described in Table 4 (sample numbers 4-8). This composite sample has the highest concentration of Cu and it is assumed that some of the individual dust samples included in this composite source category have even higher Cu concentrations. It is considered likely that one or more of the dust sources included in this composite are responsible for more of the fugitive yard dust coming from the smelter than others included in the composite. These possible dust sources would have higher Cu concentrations than reported for the composite and are possibly enriched in species such as Fe and Mn. This assumption is

consistent with the impacts and chemistry on meteorologically regime stratified days.

4.6.8 Sources Not Included

Several sources of emissions from the smelter were not characterized or included in the CMB model calculations. These sources include the main stack, acid plant stack, Cu anode blowing, bell caps, and Cu pouring. The impacts on local receptors from all of these sources were considered to be small or at least less than the process fugitive emissions measured. Consistent with this assumption is the relatively low impact from the sum of the main process fugitive emissions sources sampled and the reasonably good fits obtained for most of the fine particle filters. In addition, the low fine to coarse particle ratio for such elements as Cu suggests that the Cu anode blowing and pouring, which is expected to emit primarily fine Cu particles, is relatively unimportant.

4.7 Special Issues

4.7.1 CMB Model Results with Large Chi Square Values

It was not possible to obtain reduced chi square values close to 2.0 for several of the data sets. The worst case was for the fine particle sample collected on November 22, 1986, at the Hayden Jail where the lowest reduced chi square value that could be obtained was 10.7. The element primarily responsible for the high chi square value is K. Unfortunately, we don't have a source rich in K in our airshed source profile library. The only way the chi square value can be reduced is to eliminate K from the fitting. This may be a case where one of the smelter emissions mentioned above that were not characterized is making a substantial contribution to the fine particle fraction even though the <u>average</u> wind direction was from the west. Silicon, in addition to K, were also poorly fit in the fine fraction on this day at the Garfield

site, and a similar high chi square value obtained (6.2). In contrast, the chi square values for the corresponding coarse fraction were 2.4 at the Jail, 1.1 at Garfield. In addition, the elemental ratios for K and Si were close to 1.0 in the coarse fraction.

In this particular example, it is likely that either an uncharacterized smelter source emission impacted the fine particle filter, a source such as the mine west of the smelter impacted the site, or one of the fine particle source profiles was substantially altered. This was the only day analyzed in which the average wind direction was from the west (261°).

It is likely that similar variations in the source profiles and/or source impacts are responsible for the other samples for which high reduced chi square values were obtained.

4.7.2 Unexplained Mass and Elemental Concentrations

The unexplained mass was largest for the fine particle fraction which is typical of most airsheds. In this study, most of the unexplained fine particle mass is thought to be associated with secondary organic carbon and nitrate, as well as water and sources rich in carbon but not resolved. In some cases like that discussed in Section 4.7.1, some of the unexplained mass is probably associated with the impact from uncharacterized sources. In the coarse particle size fraction, the unexplained mass is likely due to the omission of a smelter yard dust source.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The two largest sources of PM_{10} are ore dust from the ore crusher and/or conveyor, and road dust. These sources, however, made minor contributions to the concentration of toxic elements such

as As, Cd, and Pb. The sources primarily responsible for these toxic elements are process fugitive emissions, which include slag skimming, matte tapping, converter operations, and slag pouring.

The quality of the CMB model results could be best improved through additional source characterization; i.e., better characterization of source variability and characterization of more individual fugitive dust samples such as smelter yard and enriched ore dust. Replicate samples should be collected or analyzed for road dust and the ore crusher, and individual samples of ore concentrates or other yard dust. It would also help to characterize the background aerosol.

Even with these improvements, it is not likely that major changes would occur in the relative source contributions. The most significant changes would be in the quality of the fits and the contribution of the source or sources related to the excess Cu.

6.0 REFERENCES

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4. Houck, J.E., J.A. Cooper, and E.R. Larson, "Dilution Sampling for Chemical Receptor Source Fingerprinting", Proceedings of Air Pollution Control Association, New Orleans, LA, June, 1982.

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6. Core, J.E., J.J. Shah, and J.A. Cooper, "Receptor Model Source Composition Library", U.S. EPA 450/4-85-002, U.S. EPA, Research Triangle Park, NC 27711, November, 1984.

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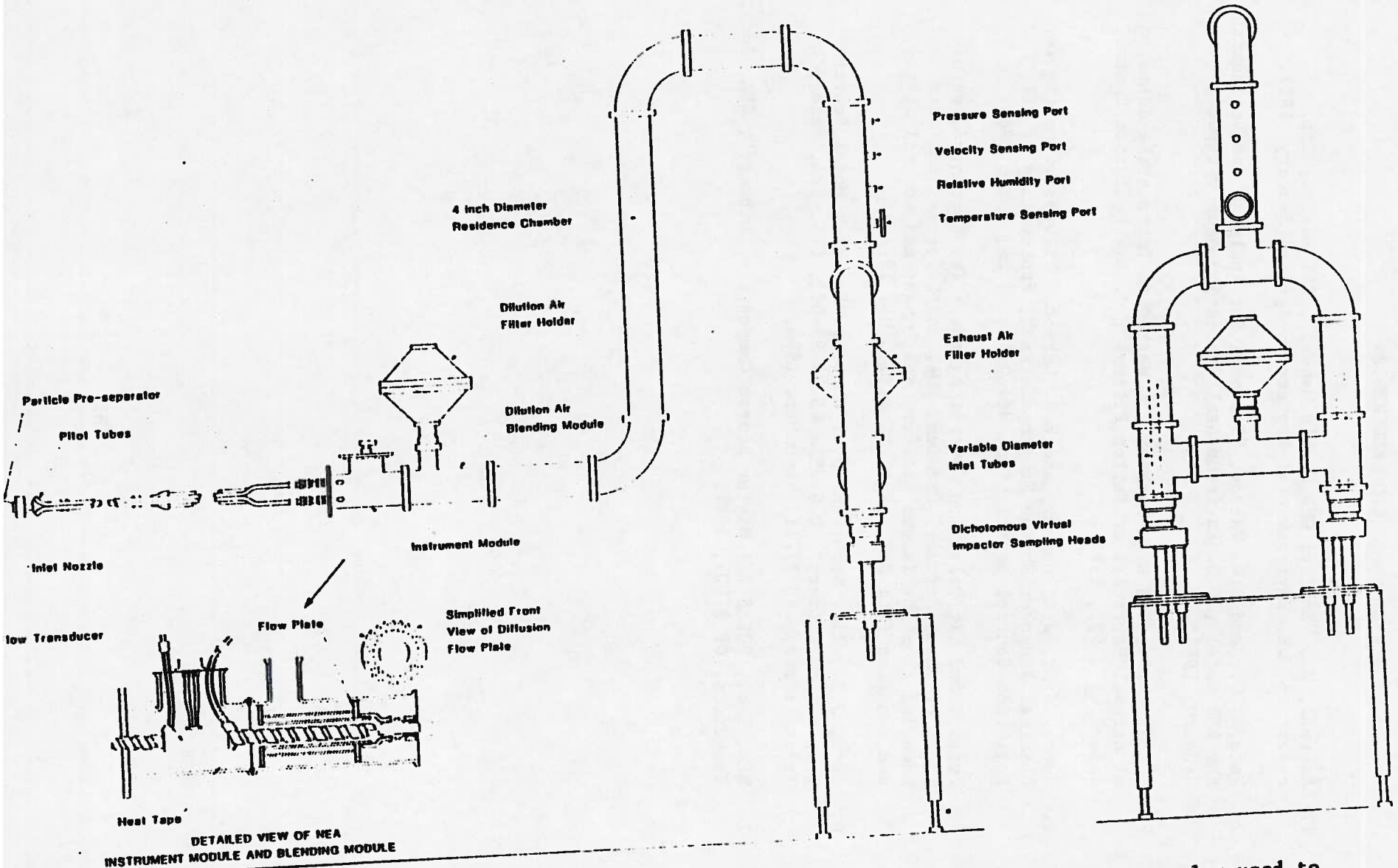


Figure 1. Schematic illustration of NEA's all stainless steel size segregating dilution sampler used to collect fine and coarse particle samples from the secondary hood ducting.

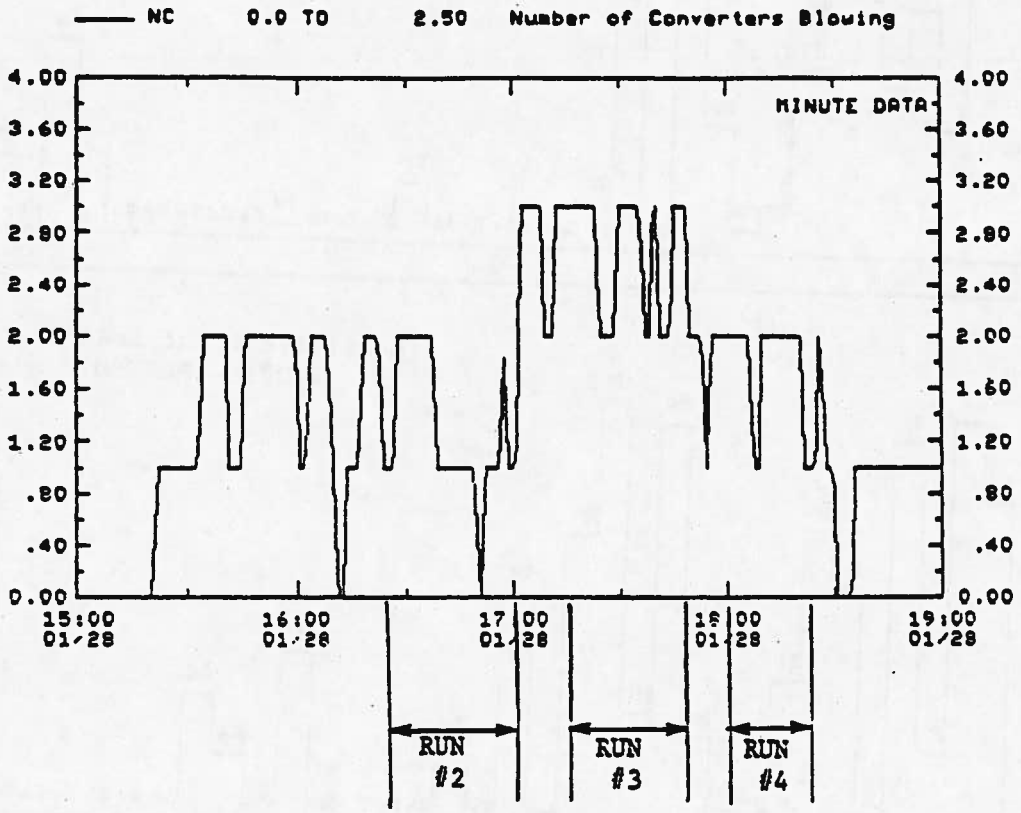


Figure 2. Diagram of Sampling Time vs. Converter Blowing

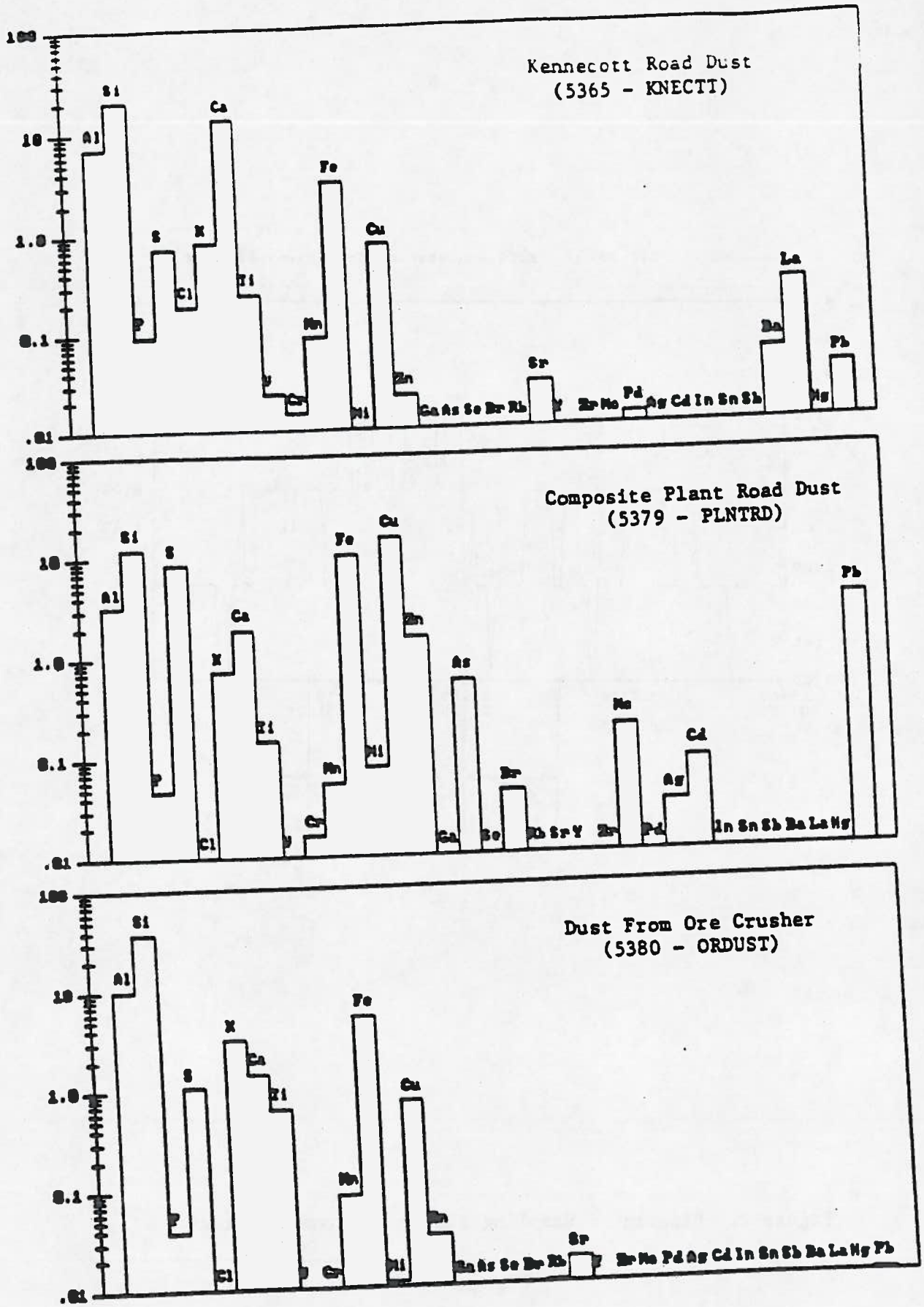


Figure 3. Comparison of the fine particle elemental profiles for the three major road dust sources.

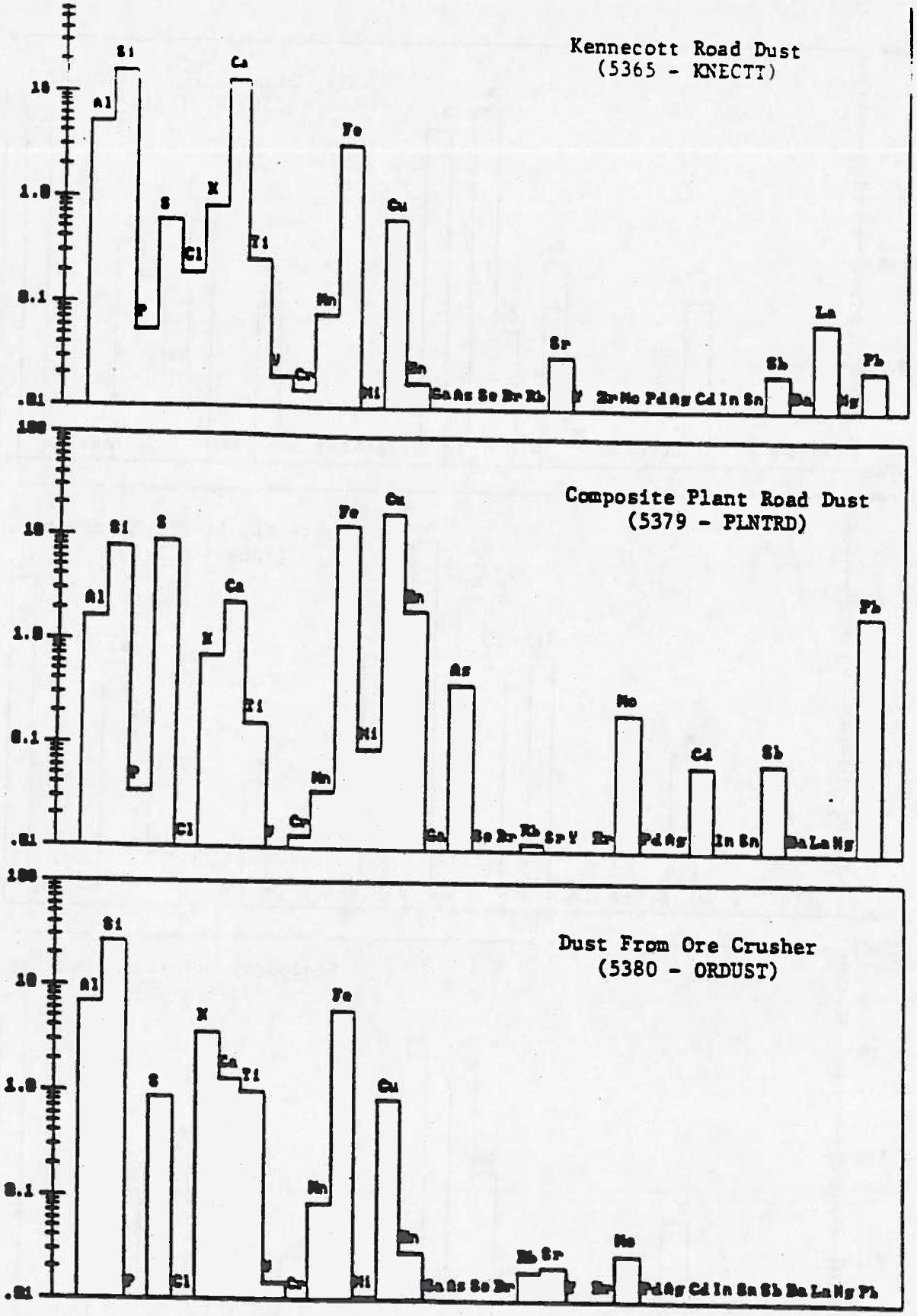


Figure 4. Comparison of the coarse particle elemental profiles for the three major road dust sources.

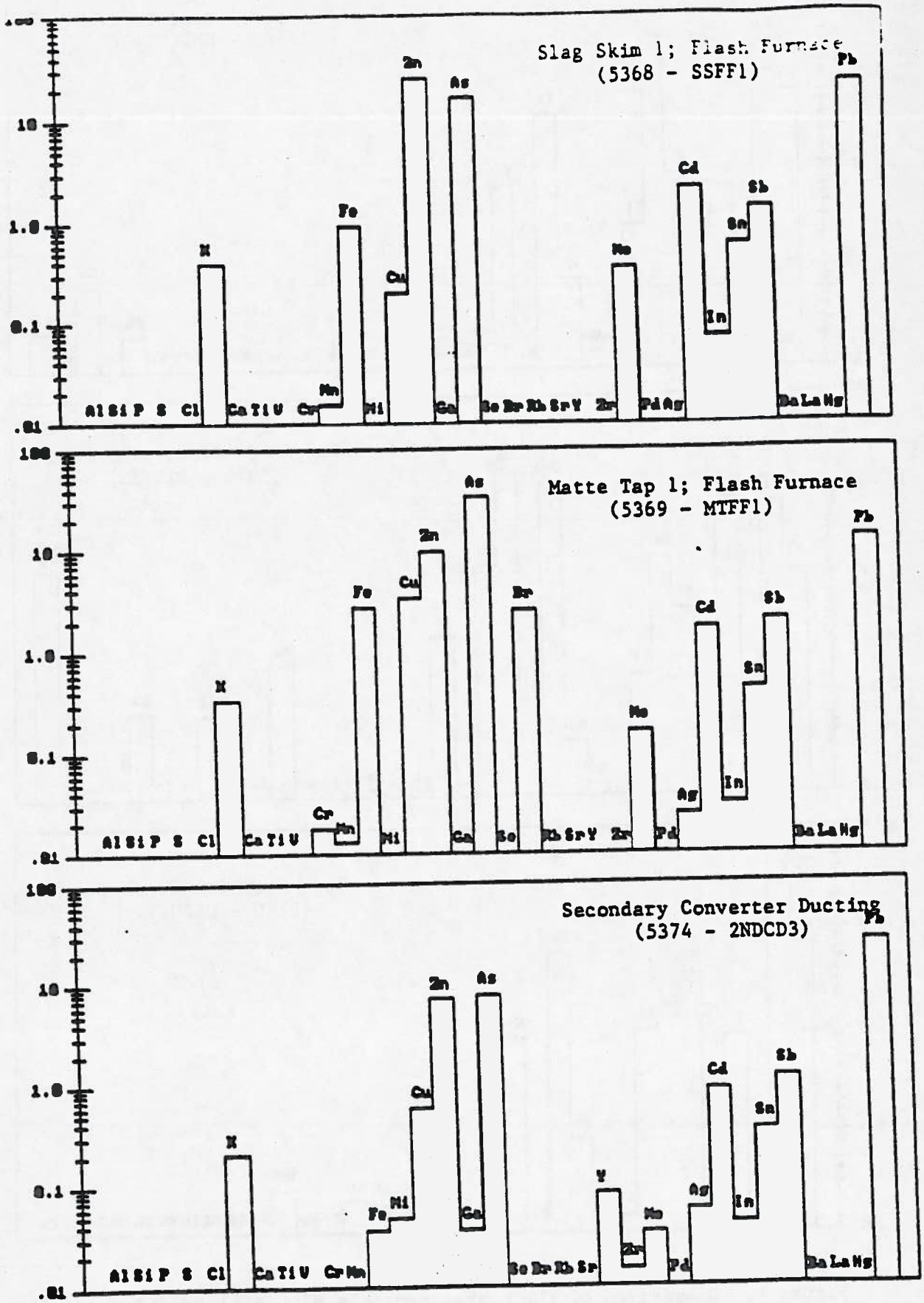


Figure 5. Comparison of the chemical profiles of the fine fraction of three representative plant emissions.

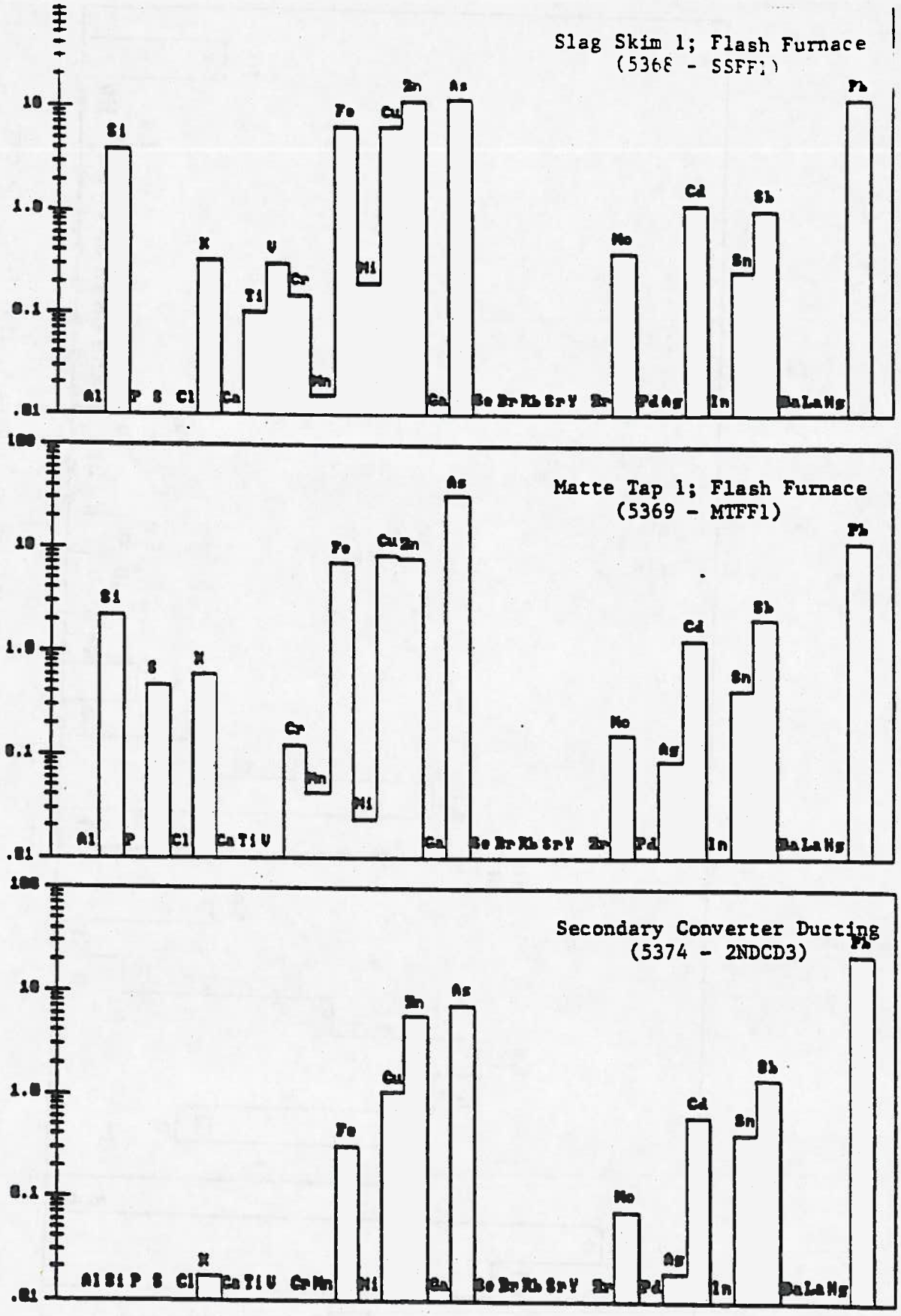


Figure 6. Comparison of the chemical profiles of the coarse fraction of three representative plant emissions.

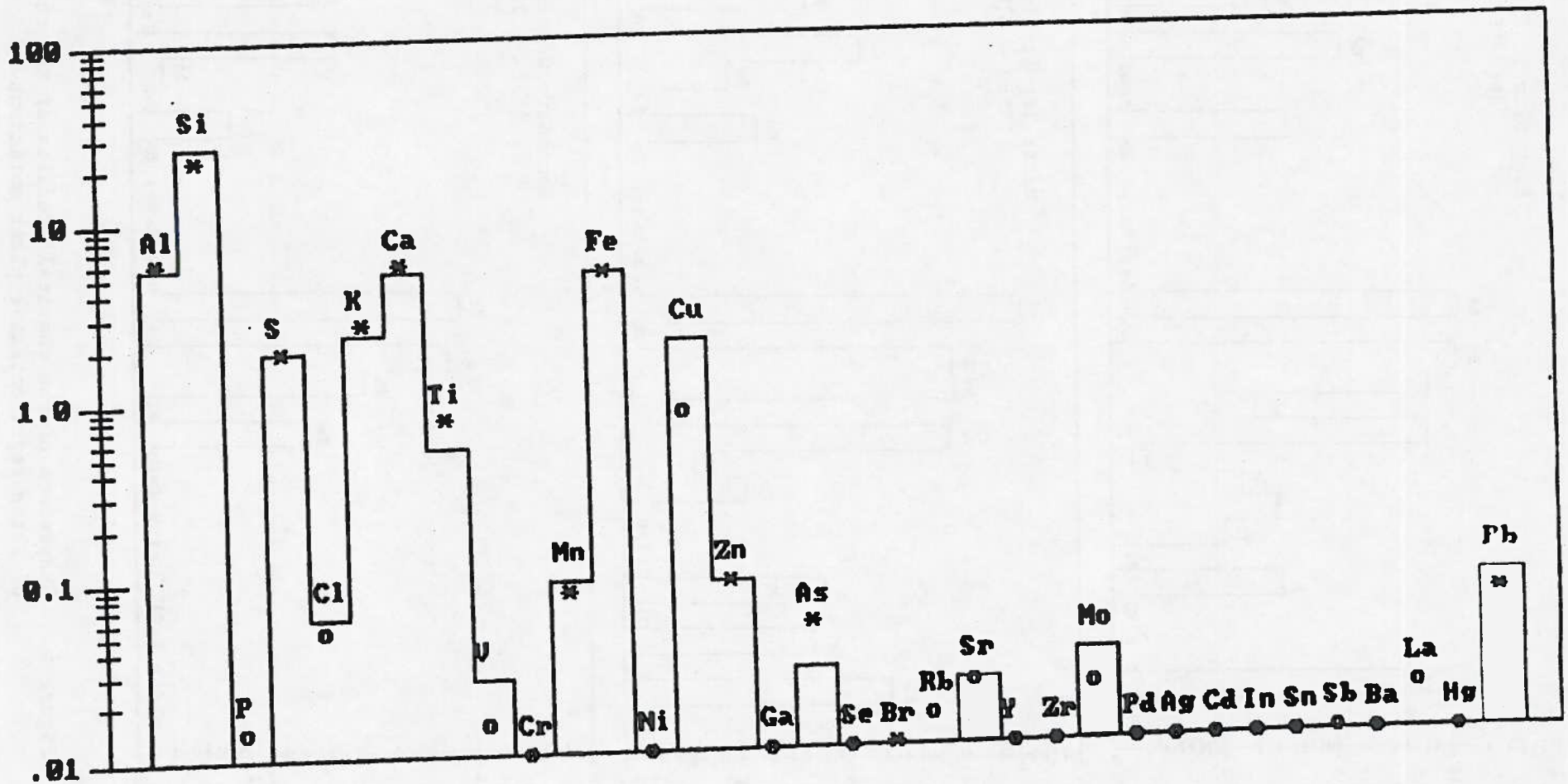


Figure 7. Histogram type plot of the ambient elemental composition on January 4, 1987 (-). The CMB model calculated concentrations for the fitting elements are illustrated with asterisks (*), while the calculated concentrations for the floating elements are illustrated with open circles (O).

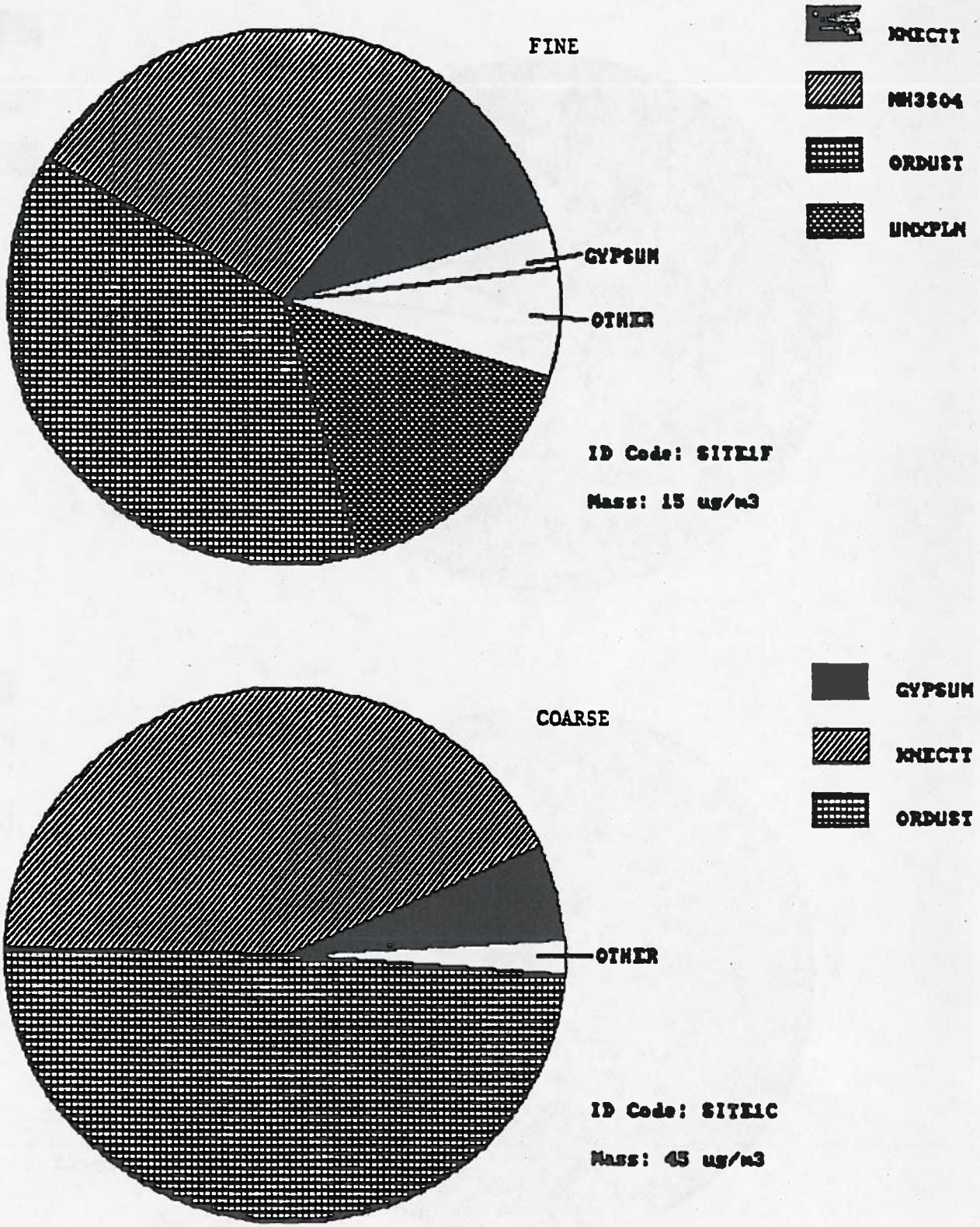
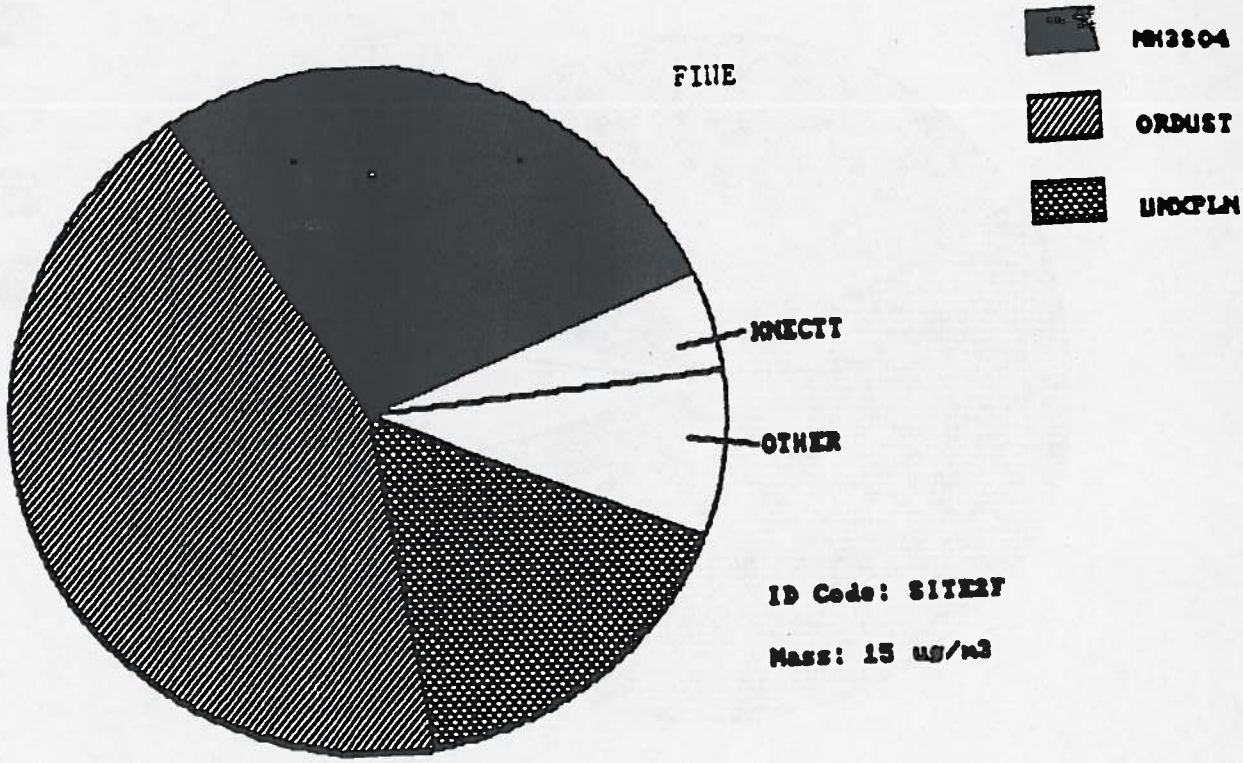


Figure 8. Hayden Jail Site - Average Source Contributions.



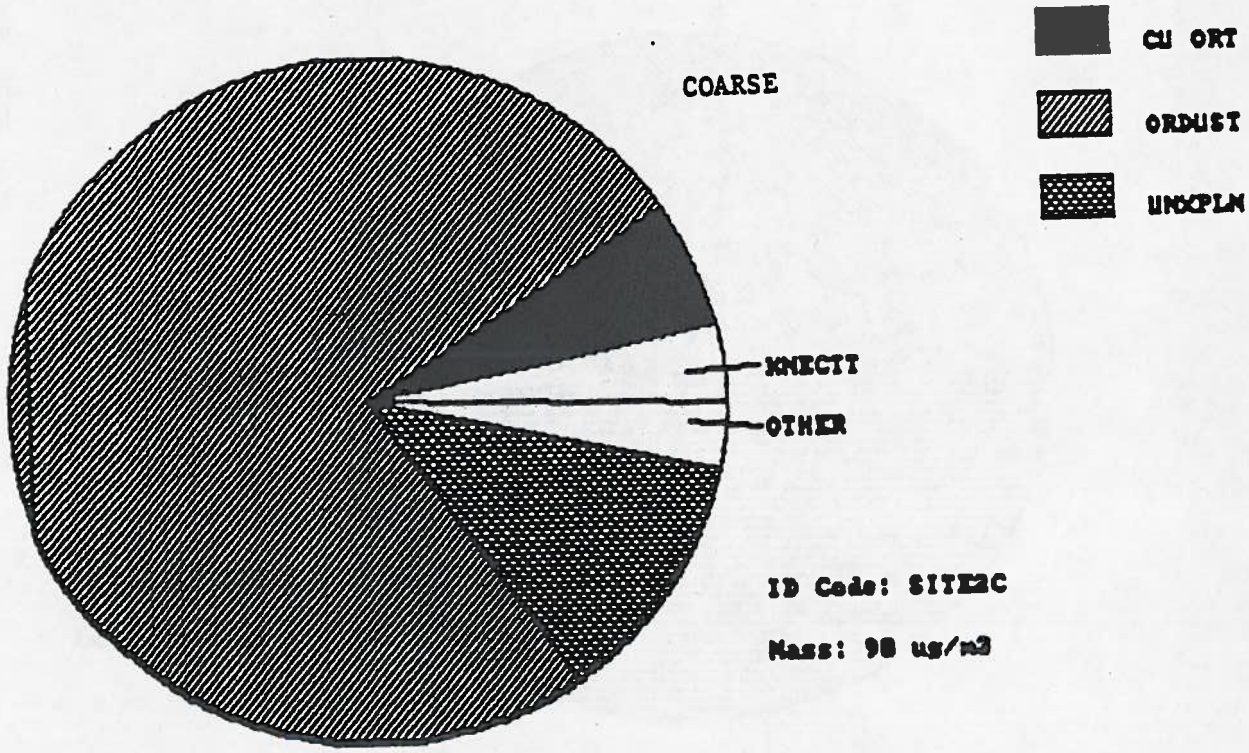


Figure 9. Garfield Site - Average Source Contribution.

Table 1

SUMMARY OF KEY FEATURES
FOR SAMPLING DAYS SELECTED FOR ANALYSIS AND SOURCE APPORTIONMENT

Date/Day	Site	Filter ID Particle Size		Wind Speed (mph)	Wind Direction*	F/C Ratio	Dichot PM_{10} ($\mu g/m^3$)	Comments & Selection Criteria
11/22/86 Saturday	1	P0591	F	2.4	261	0.254	70.85	Furnace down 0200-0530 Moderate PM_{10} values and wind from the west
		P0590	C					
	2	P0595	F			0.288	72.24	
		P0594	C					
12/1/86 Monday	1	P0597	F	2.1	106	0.318	99.27	2nd High PM_{10} (Site 1 & 2) Furnace down 0630-0830
		P0596	C					
	2	P0603	F			0.211	160.20	
		P0602	C					
12/4/86 Thursday	1	P0609	F	3.2	121	0.337	126.91	Highest PM_{10} (Site 1)
		P0608	C					
	2	P0605	F			0.232	147.46	
		P0604	C					
12/9/86 Tuesday	1	P0619	F	1.4	229	0.265	55.72	All systems down 0130-1430
		P0618	C					
12/18/86 Thursday	1	P0675	F	1.3	156	0.739	25.48	Highest F/C ratio Wind gusts from the west
		P0674	C					
	2	P0679	F			0.331	46.93	
		P0678	C					
12/24/86 Wednesday	1	P0687	F	0.9	211	0.405	45.40	Holiday High F/C ratios
		P0686	C					
	2	P0689	F			0.452	42.99	
		P0688	C					
12/28/86 Sunday	2	P0701	F	3.9	76	0.112	109.65	Furnace down 1130-1530
		P0700	C					
12/29/86 Monday	2	P0703	F	6.2	79	0.065	235.69	Highest PM_{10} (Site 2) Lowest F/C ratio Furnace down 0900-1200
		P0702	C					

Table 1
-Continued-

Date/Day	Site	Filter ID	Particle Size	Wind Speed (mph)	Wind Direction*	F/C Ratio	Dichot PM_{10} ($\mu g/m^3$)	Comments & Selection Criteria
1/4/87 Sunday	1	P0715	F	4.8	116	0.396	48.04	
		P0714	C					
1/7/87 Wednesday	1	P0751	F	0.8	181	0.502	34.09	All systems down 0630-1830 Stagnant conditions
		P0750	C			0.187	62.19	Lowest average wind speed
	2	P0755	F					
		P0754	C					
1/11/87 Sunday	1	P0761	F	6.6	81	0.218	34.36	Furnace down 2000-2230 Windy, low F/C ratio
		P0760	C			0.056	126.69	
	2	P0763	F					
		P0762	C					
1/12/87 Monday	2	P0767	F	5.0	86	0.165	111.06	Furnace down 0930-1200 and 1730-1800
		P0768	C					
1/27/87 Tuesday	1	P0783	F	4.5	132	0.232	56.87	
		P0784	C			0.394	31.91	
	2	P0779	C					
		P0780	E					
1/28/87 Wednesday	1	P0785	F	1.6	161	0.314	78.03	Furnace down 2130-2400
		P0786	C			0.330	82.87	
	2	P0781	F					
		P0782	C					
1/30/87 Friday	1	P0791	F	2.4	124	0.180	71.47	Rain, F/C ratios low and PM_{10} values relatively high
		P0792	C			0.086	128.47	
	2	P0787	F					
		P0788	C					

*Wind direction based upon 360° circle. Winds out of due geographic north would measure 0°, due east 90°, due south 180°, and winds out of due west 270°.

Table 2

DAYS INCLUDED IN METEOROLOGICAL REGIMES
AND REGIME CHARACTERISTICS

No.	Description	Speed/Direction	Dates Included
1	High wind speed from the East	(>5 mph, 79°-86°) DIRECTION?	12/29/86, 1/11/87 1/12/87
2	Low wind speed from the South	(<1.6 mph, 156°-211°)	12/9/86, 12/18/86 12/24/86, 1/7/87 1/28/87
3	Moderate wind speed from the Southeast	(>2,<5, 106°-132°)	12/1/86, 12/4/86 1/4/87, 1/27/87 1/30/87
4	Moderate wind speed from the West	(2.4, 261°)	11/22/86
5	Moderate wind speed from the East	(3.9, 76°)	12/28/86

Table 3

SUMMARY OF CONVERTER ACTIVITY
DURING SAMPLE RUN TIMES

Sample Period	Converter #1	Converter #2	Converter #4
Run #2 1624 - 1700	Slag blowing(O_2)[a] Pouring Slag cold dope[c]	Pouring Matte	Copper blowing
Run #3[b] 1713 - 1745	Copper blowing cold dope	Pouring Matte cold dope Slag blowing(O_2)	Copper blowing
Run #4 1800 - 1822	Copper blowing	Slag blowing(O_2) Pouring Matte	Transfer to Anode furnace

[a](O_2) - Oxygen blowing

[b]Run #3 sampled during a period when three converters were blowing simultaneously.

[c]Cold dope - contains converter aisle clean-up and other recyclables such as matte ladle slag shells

Table 4

BULK SAMPLES COLLECTED
FROM THE ASARCO-HAYDEN SMELTER

Sample Number	Description	Comments
1	Ore concentrate collected from storage bin area	-
*2	Charged ore mixture collected from loading hopper	A, B_1
3	Recyclable pile of matte dust	-
*4	Road dust collected from east side of converters	B_1, C, B_2
*5	Road dust collected from southwest side of converters between pile storage	B_1, C, B_2
*6	Road dust collected from charge preparation area and unloading dock	B_1, C, B_2
*7	Road dust collected from area between proportioning bins and conveyer belt	B_1, C, B_2
*8	Road dust collected from area near main gate at convergence of three roads	B_1, C, B_2
9	Material collected from furnace duct port	-
*10	Dust collected from top level of ore crusher building	not sieved

A - sample dried @ 100°C
B_1- sample sieved through 40 mesh
B_2- sample sieved through 400 mesh
C - sample composited
* - analyzed by XRF

Table 5

SUMMARY OF ROAD DUST AND CRUSTAL SAMPLES
COLLECTED AT THE HAYDEN SITE

Sample #	Sample Method	Description
1	Vacuum	Canyon Drive East of sampler array
2	Grab	Jailhouse gravel parking lot South of sampler array
3	Grab	Open area approximately 100 M South of jailhouse
4	Grab	Gravel road West of jailhouse (and sampler array) and West of wash (Kennecott Road)
5	Grab	Copper ore tailings
6	Grab	Copper ore (high moisture content)

Table 6

SUMMARY OF SAMPLING DATA
FOR PROCESS EMISSIONS
COLLECTED AT THE ASARCO-HAYDEN COPPER SMELTER

Filter ID	Run #	Source Description	Filter Type	Particle Size (μ)	Sample Time (start/stop)	Duration (min)	Volume (m^3)	Temperature °C Flue	Ambient	D.Chamber	Corrected Mass (μg)	Comments
*P0949	1	Slag skim; flash furnace	T	<2.5	27:1332-1402	30.0	0.50	34	26	35°	8372	
*P0950	1	Slag skim; flash furnace	T	>2.5 and <10	27:1332-1402	30.0	0.50	34	26	35°	870	
P0951	2	Matte & slag tap; flash furn.	T	<2.5	27:1510-1521	10.8	0.18	34	26	33°	1934	A
P0952	2	Matte & slag tap; flash furn.	T	>2.5 and <10	27:1510-1521	10.8	0.18	34	26	33°	154	
*P0953	3	Matte tap; flash furnace	T	<2.5	27:1541-1557	16.2	0.27	36	25	32	10252	B
*P0954	3	Matte tap; flash furnace	T	>2.5 and <10	27:1541-1557	16.2	0.27	36	25	32	682	
*P0955	4	Matte tap; flash furnace	T	<2.5	27:1608-1620	11.4	0.19	50	25	35	14579	B
*P0956	4	Matte tap; flash furnace	T	>2.5 and <10	27:1608-1620	11.4	0.19	50	25	35	994	
P0957	5	Matte & slag tap; flash furn.	T	<2.5	27:1638-1654	15.6	0.26	55	24	39	30577	A
P0958	5	Matte & slag tap; flash furn.	T	>2.5 and <10	27:1638-1654	15.6	0.26	55	24	39	2071	
*P0961	6	Slag skim; flash furnace	T	<2.5	28:0811-0825	14.4	0.24	34	9	20	2934	
*P0962	6	Slag skim; flash furnace	T	>2.5 and <10	28:0811-0825	14.4	0.24	34	9	20	354	
*P0965	2	Secondary converter ducting	T	<2.5	28:1624-1700	36.6	0.61	82	31	35	17381	C
*P0966	2	Secondary converter ducting	T	>2.5 and <10	28:1624-1700	36.6	0.61	82	31	35	924	
*P0967	3	Secondary converter ducting	T	<2.5	28:1713-1745	32.4	0.54	89	27	32	15072	C
*P0968	3	Secondary converter ducting	T	>2.5 and <10	28:1713-1745	32.4	0.54	89	27	32	1311	
*P0969	4	Secondary converter ducting	T	<2.5	28:1800-1822	21.6	0.36	110	23	28	5407	C
*P0970	4	Secondary converter ducting	T	>2.5 and <10	28:1800-1822	21.6	0.36	110	23	28	355	
*P0971	1	Slag pour	T	<2.5	29:1541-1544	3.0	0.05	-	34	35	1102	D
*P0972	1	Slag pour	T	>2.5 and <10	29:1541-1544	3.0	0.05	-	34	35	51	
*P0973	2	Slag pour	T	<2.5	29:1630-1634	3.6	0.06	-	30	35	1252	D
*P0974	2	Slag pour	T	>2.5 and <10	29:1630-1634	3.6	0.06	-	30	35	69	
*P0975	1	Ore crusher building	T	<2.5	29:0914-1159	165.0	2.76	-	-	-	412	E
P0976	1	Ore crusher building	T	>2.5 and <10	29:0914-1159	165.0	2.76	-	-	-	-	
P0977	2	Ore crusher building	T	<2.5	29:1413-1631	138.0	2.30	-	-	-	3366	E
P0978	2	Ore crusher building	T	>2.5 and <10	29:1413-1631	138.0	2.30	-	-	-	-	

Comment Key:

A. Combination of slag skimming and matte tap
B. Two consecutive matte taps during sample time
C. See Table for converter activity
D. Two slag pours per filter pair; coarse filter collimated
E. All three crushers running
F. 37 mm Teflon membrane

*Filters selected for XRF analysis

Table 7

SUMMARY OF ASARCO-HAYDEN RESUSPENSION DATA

Sample Number and Description	Sample Type*	Filter ID	Final Net Deposit (μg)	Ratio of Net Intermediate Fine to Net Coarse
#2 Charged ore mixture	dichot fine dichot coarse	P1029 P1030	182 2361	0.076 (1:13)
#4,#5,#6,#7,#8 Composited Smelter Yard and Road Dust	dichot fine dichot coarse	P1031 P1032	200 2489	0.076 (1:13)
#10 Dust from Ore Crusher	dichot fine dichot coarse	P1033 P1034	199 2555	0.042 (1:24)

*Fine is < 2.5 μm, Coarse is 2.5 μm - 10 μm

Table 8

SUMMARY OF HAYDEN AEROSOL MASS

(November 22, 1986, through January 30, 1987)

Date	Site	Filter ID	Size	F/C Ratio	($\mu g/m^2$)
11/22/86 Saturday	1	P0591	F	0.254	14.33
		P0590	C		56.52
			PM_{10}		70.85
	2	P0593	F	0.292	16.24
		P0592	C		55.47
			PM_{10}		71.71
	2	P0595	F	0.288	16.18
		P0594	C		56.06
			PM_{10}		72.24
11/28/86 Friday	1	P0599	F	2.786[a]	650.00[a]
		P0598	C		233.33[a]
			PM_{10}		883.33[a]
	2	P0601	F	.106	10.68
		P0600	C		100.59
			PM_{10}		111.26
12/01/86 Monday	1	P0597	F	.318	23.68
		P0596	C		75.59
			PM_{10}		99.27
	2	P0603	F	.211	27.96
		P0602	C		132.24
			PM_{10}		160.20
12/04/86 Thursday	1	P0609	F	.337	31.99
		P0608	C		94.92
			PM_{10}		126.91
	2	P0605	F	.232	27.76
		P0604	C		119.70
			PM_{10}		147.46
12/07/86 Sunday	1	P0611	F	.933	5.81
		P0610	C		6.22
			PM_{10}		12.03
	2	P0607	F	1.611	7.20
		P0606	C		4.45
			PM_{10}		11.65
12/09/86 Tuesday	1	P0621	F	.265	11.70
		P0620	C		44.03
			PM_{10}		55.72
	1	P0619	F	.723	9.63
		P0618	C		13.31
			PM_{10}		22.94
	2	P0613	F	.574	9.82
		P0612	C		17.10
			PM_{10}		26.92
	2	P0617	F	.755	13.23
		P0616	C		17.50
			PM_{10}		30.73

Table 8

-Continued-

Date	Site	Filter ID	Size	F/C Ratio	($\mu g/m^2$)
12/10/86 Wednesday	2	P0615	F	.422	7.35
		P0614	C		17.41
			PM_{10}		24.76
12/18/86 Thursday	1	P0675	F	.739	10.84
		P0674	C		14.64
			PM_{10}		25.48
	2	P0679	F	.331	11.69
		P0678	C		35.23
			PM_{10}		46.93
12/19/86 Friday	1	P0677	F	.975	8.26
		P0676	C		8.48
			PM_{10}		16.74
	2	P0681	F	.534	10.97
		P0680	C		20.51
			PM_{10}		31.47
12/20/86 Saturday	2	P0683	F	.610	8.79
		P0682	C		14.37
			PM_{10}		23.16
12/23/86 Tuesday	1	P0685	F	.272	11.69
		P0684	C		42.98
			PM_{10}		54.67
	2	P0693	F	.340	11.23
		P0692	C		33.07
			PM_{10}		44.30
12/24/86 Wednesday	1	P0687	F	.405	13.07
		P0686	C		32.33
			PM_{10}		45.40
	2	P0689	F	.452	13.40
		P0688	C		29.58
			PM_{10}		42.99
12/25/86 Thursday	2	P0691	F	.346	21.89
		P0690	C		63.33
			PM_{10}		85.23
12/27/86 Saturday	1	P0695	F	.484	12.69
		P0694	C		26.28
			PM_{10}		38.96
	2	P0699	F	.281	12.80
		P0698	C		45.67
			PM_{10}		58.48
12/28/86 Sunday	1	P0697	F	.507	6.48
		P0696	C		12.84
			PM_{10}		19.32
	2	P0701	F	.112	11.08
		P0700	C		98.57
			PM_{10}		109.65

Table 8

-Continued-

Date	Site	Filter ID	Size	F/C Ratio	($\mu g/m^2$)
12/29/86 Monday	2	P0703	F	.065	14.32
		P0702	C		221.36
			PM_{10}		235.69
12/31/86 Wednesday	1	P0705	F	.275	12.12
		P0704	C		44.07
			PM_{10}		56.19
	2	P0709	F	.208	8.87
		P0708	C		42.66
			PM_{10}		51.53
1/01/87 Thursday	1	P0707	F	.388	14.75
		P0706	C		38.08
			PM_{10}		52.83
	2	P0711	F	.249	12.97
		P0710	C		51.92
			PM_{10}		64.89
1/03/87 Saturday	1	P0713	F	.329	9.09
		P0712	C		27.66
			PM_{10}		36.75
	2	P0719	F	.145	7.92
		P0718	C		54.48
			PM_{10}		62.40
1/04/87 Sunday	1	P0715	F	.396	13.64
		P0714	C		34.40
			PM_{10}		48.04
	2	P0717	F	.412	17.14
		P0716	C		41.70
			PM_{10}		58.84
1/05/87 Monday	2	P0721	F	.487	12.47
		P0720	C		25.56
			PM_{10}		38.03
1/07/87 Wednesday	1	P0751	F	.502	11.41
		P0750	C		22.68
			PM_{10}		34.09
	2	P0755	F	.187	9.80
		P0754	C		52.40
			PM_{10}		62.19
1/08/87 Thursday	1	P0753	F	.382	7.16
		P0752	C		18.70
			PM_{10}		25.86
	2	P0757	F	.166	8.91
		P0756	C		53.56
			PM_{10}		62.47

Table 8

-Continued-

Date	Site	Filter ID	Size	F/C Ratio	($\mu g/m^2$)
1/10/86 Saturday	1	P0759	F	.379	7.03
		P0758	C		18.54
			PM_{10}		25.58
	2	P0765	F	.134	9.92
		P0764	C		73.87
			PM_{10}		83.78
1/11/87 Sunday	1	P0761	F	.218	6.18
		P0760	C		28.18
			PM_{10}		34.36
	2	P0763	F	.056	6.78
		P0762	C		119.91
			PM_{10}		126.69
1/12/87 Monday	2	P0767	F	.165	15.76
		P0768	C		95.31
			PM_{10}		111.06
1/27/87 Tuesday	1	P0783	F	.232	10.71
		P0784	C		46.16
			PM_{10}		56.87
	2	P0780	F	.394	9.02
		P0779	C		22.89
			PM_{10}		31.91
1/28/87 Wednesday	1	P0785	F	.314	18.67
		P0786	C		59.36
			PM_{10}		78.03
	2	P0781	F	.330	20.55
		P0780	C		62.35
			PM_{10}		82.87
1/30/87 Friday	1	P0791	F	.180	10.93
		P0792	C		60.54
			PM_{10}		71.47
	2	P0787	F	.086	10.12
		P0788	C		118.35
			PM_{10}		128.47
1/31/87 Saturday	1	P0793	F	.730	7.45
		P0796	C		10.20
			PM_{10}		17.65
	2	P0789	F	.634	10.89
		P0790	C		17.18
			PM_{10}		28.07

[a]Four minute sample. Results not included in calculations.

Table 9

COMPARISON OF MEAN SUSPENDED PARTICULATE MASS
AT HAYDEN SAMPLING SITES

Site No.	Description	Fine	Coarse	PM10	F/C Ratio*
1	Hayden Jail	12 ± 6	35 ± 22	47 ± 28	0.43 ± 0.26
	Range (n=30)	5.8 - 32	6.2 - 95	12.0 - 127	0.18 ± 0.7
2	Garfield	13 ± 5	60 ± 46	73 ± 49	0.35 ± 0.79
	Range (n=24)	6.8 - 28.0	4.4 - 221	11.6 - 236	0.05 ± 1.61
Days Selected					
1	Hayden Jail (n=12)	14.6	44.9	59.5	0.32
2	Garfield (n=13)	15.0	89.6	104.5	0.17

*Average fine to coarse ratio

Table 10

AVERAGE FINE PARTICLE ELEMENTAL COMPOSITION

Species	μg/m³		Percent	
	Hayden Jail	Garfield	Hayden Jail	Garfield
Al	0.4858 ± 0.5228	0.5498 ± 0.4604	3.335 ± 3.576	3.667 ± 3.050
Si	2.5157 ± 2.4963	2.8617 ± 2.6311	17.273 ±17.059	19.086 ±17.452
P	0.0119 ± 0.0184	0.0084 ± 0.0137	0.082 ± 0.126	0.056 ± 0.091
S	1.1033 ± 0.4546	1.1017 ± 0.4476	7.575 ± 3.036	7.348 ± 2.901
Cl	0.0238 ± 0.0177	0.0507 ± 0.1001	0.163 ± 0.120	0.338 ± 0.667
K	0.2325 ± 0.1823	0.2636 ± 0.2064	1.596 ± 1.242	1.758 ± 1.366
Ca	0.3538 ± 0.2983	0.2111 ± 0.1757	2.429 ± 2.035	1.408 ± 1.164
Ti	0.0454 ± 0.0547	0.0468 ± 0.0507	0.312 ± 0.375	0.312 ± 0.337
V	0.0013 ± 0.0019	0.0021 ± 0.0024	0.009 ± 0.013	0.014 ± 0.016
Cr	0.0009 ± 0.0012	0.0008 ± 0.0011	0.006 ± 0.008	0.006 ± 0.007
Mn	0.0087 ± 0.0169	0.0116 ± 0.0202	0.060 ± 0.116	0.077 ± 0.135
Fe	0.3728 ± 0.3791	0.3865 ± 0.3716	2.560 ± 2.592	2.578 ± 2.466
Ni	0.0013 ± 0.0014	0.0015 ± 0.0015	0.009 ± 0.010	0.010 ± 0.010
Cu	0.2237 ± 0.1588	0.1679 ± 0.0923	1.536 ± 1.080	1.120 ± 0.606
Zn	0.0800 ± 0.0765	0.0748 ± 0.0432	0.549 ± 0.523	0.499 ± 0.284
Ga	0.0006 ± 0.0007	0.0006 ± 0.0005	0.004 ± 0.005	0.004 ± 0.003
As	0.0791 ± 0.0801	0.0963 ± 0.0998	0.543 ± 0.547	0.643 ± 0.663
Se	0.0113 ± 0.0061	0.0127 ± 0.0098	0.078 ± 0.041	0.084 ± 0.065
Br	0.0039 ± 0.0018	0.0034 ± 0.0022	0.026 ± 0.012	0.023 ± 0.015
Rb	0.0004 ± 0.0008	0.0003 ± 0.0008	0.003 ± 0.005	0.002 ± 0.005
Sr	0.0012 ± 0.0013	0.0010 ± 0.0012	0.008 ± 0.009	0.007 ± 0.008
Y	0.0000 ± 0.0003	0.0001 ± 0.0003	0.000 ± 0.002	0.001 ± 0.002
Zr	0.0000 ± 0.0010	0.0000 ± 0.0009	0.000 ± 0.007	0.000 ± 0.006
Mo	0.0013 ± 0.0039	0.0015 ± 0.0035	0.009 ± 0.026	0.010 ± 0.023
Pd	0.0000 ± 0.0006	0.0000 ± 0.0005	0.000 ± 0.004	0.000 ± 0.004
Ag	0.0000 ± 0.0008	0.0000 ± 0.0007	0.000 ± 0.006	0.000 ± 0.005
Cd	0.0054 ± 0.0067	0.0052 ± 0.0069	0.037 ± 0.046	0.034 ± 0.046
In	0.0000 ± 0.0013	0.0000 ± 0.0011	0.000 ± 0.009	0.000 ± 0.008
Sn	0.0000 ± 0.0016	0.0000 ± 0.0014	0.000 ± 0.011	0.000 ± 0.009
Sb	0.0038 ± 0.0132	0.0017 ± 0.0062	0.026 ± 0.090	0.011 ± 0.041
Ba	0.0000 ± 0.0064	0.0000 ± 0.0056	0.000 ± 0.044	0.000 ± 0.037
La	0.0000 ± 0.0118	0.0000 ± 0.0102	0.000 ± 0.081	0.000 ± 0.068
Hg	0.0004 ± 0.0004	0.0004 ± 0.0004	0.002 ± 0.003	0.003 ± 0.003
Pb	0.1664 ± 0.1152	0.1737 ± 0.0834	1.143 ± 0.783	1.159 ± 0.545

Table 11

AVERAGE COARSE PARTICLE ELEMENTAL COMPOSITION

Species	μg/m³		Percent	
	Hayden Jail	Garfield	Hayden Jail	Garfield
Al	2.1035 ± 1.3704	4.6364 ± 2.2458	4.685 ± 3.017	5.182 ± 2.456
Si	9.7309 ± 2.1813	20.7171 ± 2.5052	21.674 ± 4.353	23.156 ± 1.579
P	0.0276 ± 0.0585	0.0308 ± 0.0443	0.062 ± 0.130	0.034 ± 0.049
S	0.8378 ± 0.4305	1.0524 ± 0.4497	1.866 ± 0.941	1.176 ± 0.489
Cl	0.0255 ± 0.0198	0.0216 ± 0.0296	0.057 ± 0.044	0.024 ± 0.033
K	0.8308 ± 0.5338	2.6364 ± 1.6353	1.850 ± 1.175	2.947 ± 1.804
Ca	3.6350 ± 2.8756	2.0362 ± 1.3292	8.096 ± 6.354	2.276 ± 1.468
Ti	0.2373 ± 0.2005	0.6505 ± 0.5663	0.529 ± 0.444	0.727 ± 0.629
V	0.0126 ± 0.0082	0.0280 ± 0.0237	0.028 ± 0.018	0.031 ± 0.026
Cr	0.0000 ± 0.0003	0.0000 ± 0.0005	0.000 ± 0.001	0.000 ± 0.001
Mn	0.0471 ± 0.0413	0.1042 ± 0.0971	0.105 ± 0.091	0.116 ± 0.108
Fe	2.2803 ± 1.5360	4.9837 ± 4.0328	5.079 ± 3.384	5.570 ± 4.473
Ni	0.0015 ± 0.0017	0.0036 ± 0.0028	0.003 ± 0.004	0.004 ± 0.003
Cu	0.9055 ± 0.6046	1.0881 ± 0.5799	2.017 ± 1.332	1.216 ± 0.637
Zn	0.0384 ± 0.0271	0.0615 ± 0.0363	0.086 ± 0.060	0.069 ± 0.040
Ga	0.0003 ± 0.0008	0.0005 ± 0.0016	0.001 ± 0.002	0.001 ± 0.002
As	0.0148 ± 0.0127	0.0221 ± 0.0215	0.033 ± 0.028	0.025 ± 0.024
Se	0.0007 ± 0.0011	0.0013 ± 0.0015	0.002 ± 0.002	0.001 ± 0.002
Br	0.0008 ± 0.0016	0.0003 ± 0.0007	0.002 ± 0.004	0.000 ± 0.001
Rb	0.0039 ± 0.0036	0.0138 ± 0.0108	0.009 ± 0.008	0.015 ± 0.012
Sr	0.0142 ± 0.0096	0.0200 ± 0.0113	0.032 ± 0.021	0.022 ± 0.012
Y	0.0003 ± 0.0005	0.0033 ± 0.0037	0.001 ± 0.001	0.004 ± 0.004
Zr	0.0000 ± 0.0010	0.0007 ± 0.0019	0.000 ± 0.002	0.001 ± 0.002
Mo	0.0142 ± 0.0115	0.0297 ± 0.0170	0.032 ± 0.025	0.033 ± 0.019
Pd	0.0000 ± 0.0005	0.0000 ± 0.0006	0.000 ± 0.001	0.000 ± 0.001
Ag	0.0000 ± 0.0007	0.0000 ± 0.0007	0.000 ± 0.002	0.000 ± 0.001
Cd	0.0000 ± 0.0009	0.0000 ± 0.0010	0.000 ± 0.002	0.000 ± 0.001
In	0.0000 ± 0.0011	0.0000 ± 0.0012	0.000 ± 0.002	0.000 ± 0.001
Sn	0.0000 ± 0.0014	0.0000 ± 0.0014	0.000 ± 0.003	0.000 ± 0.002
Sb	0.0000 ± 0.0029	0.0000 ± 0.0031	0.000 ± 0.007	0.000 ± 0.003
Ba	0.0000 ± 0.0055	0.0118 ± 0.0298	0.000 ± 0.012	0.013 ± 0.033
La	0.0000 ± 0.0099	0.0066 ± 0.0237	0.000 ± 0.022	0.007 ± 0.026
Hg	0.0000 ± 0.0002	0.0004 ± 0.0009	0.000 ± 0.000	0.000 ± 0.001
Pb	0.0342 ± 0.0191	0.0453 ± 0.0234	0.076 ± 0.042	0.051 ± 0.026

Table 12

ELEMENTAL RATIOS

Element	μg/m³				Percent			
	Fine/Coarse Ratio		Site 1/Site 2 Ratio		Fine/Coarse Ratio		Site 1/Site 2 Ratio	
	Site 1	Site 2	Fine	Coarse	Site 1	Site 2	Fine	Coarse
Al	0.231	0.119	0.884	0.454	0.712	0.708	0.909	0.904
Si	0.259	0.138	0.879	0.470	0.797	0.824	0.905	0.936
S	1.317	1.047	1.001	0.796	4.059	6.248	1.030	1.587
Cl	0.933	2.347	0.469	1.181	2.860	14.083	0.482	2.375
K	0.280	0.100	0.882	0.315	0.863	0.596	0.908	0.628
Ca	0.097	0.104	1.676	1.785	0.300	0.619	1.725	3.557
Ti	0.191	0.072	0.970	0.365	0.590	0.429	1.000	0.728
V	0.103	0.075	0.619	0.450	0.321	0.452	0.643	0.903
Cr	-	-	1.125	-	-	-	1.000	-
Mn	0.185	0.111	0.75	0.452	0.571	0.664	0.779	0.905
Fe	0.163	0.077	0.964	0.458	0.504	0.463	0.993	0.912
Ni	0.867	0.417	0.867	0.417	3.000	2.500	0.900	0.750
Cu	0.247	0.154	1.332	0.832	0.762	0.921	1.371	1.659
Zn	2.083	1.216	1.069	0.624	6.384	7.232	1.100	1.246
As	5.344	4.357	0.821	0.670	16.455	25.720	0.844	1.320
Cd	-	-	1.138	-	-	-	1.088	-
Sb	-	-	2.235	-	-	-	2.364	-
Pb	4.865	3.834	0.958	0.755	15.039	22.725	0.986	1.490

Table 13

LIST OF SOURCE CODES, MNEMONICS, AND DESCRIPTIONS

Code	Mnemonic NEA	Mnemonic EPA	Description
5015	WOOD	WOOD	Residential Wood Combustion
5038	OILCBT	OILCB	Residual Oil Combustion
5092	SHALE	SHALE	Crustal Shale
5093	LIME	LIME	Crustal Limestone
5095	NH3SO4	5095	Ammonium Sulfate (Secondary Sulfur)
5116	CaO	CaO	Lime Handling
5117	GYPSUM	GYPSU	Gypsum Handling ($CaSo_4 \cdot H_2O$)
5127	2ND OC	2ND O	Secondary Organic Carbon
5334	OIL123	OIL12	Residual Oil Power Plant Boiler (SD)
5345	TRANS	TRANS	Motor Vehicle Emissions
5363	CANDRD	CANDR	Canyon Drive Road Dust
5364	JPARK	JPARK	Jailhouse Parking Lot Road Dust
5365	KNECTT	KNECT	Kennecott Road Dust
5366	CU ORT	CU OR	Copper Ore Tailings from Pond
5367	CU OR	OR CU	Copper Ore
5368	SSFF1	SSFF1	Slag Skim; Flash Furnace #1
5369	MTFF1	MTFF1	Matte Tap; Flash Furnace #1
5370	MTFF2	MTFF2	Matte Tap; Flash Furnace #2
5371	SSFF2	SSFF2	Slag Skim; Flash Furnace #2
5372	2NDCD1	2NCD1	Secondary Converter Ducting #1
5373	2NDCD2	2NCD2	Secondary Converter Ducting #2
5374	2NDCD3	2NCD3	Secondary Converter Ducting #3
5375	SLPR#1	SLPR#	Slag Pour #1
5376	SLPR#2	SLPR2	Slag Pour #2
5377	ORCRBL	ORCRB	Ore Crusher Building
5378	CHORMX	CHORM	Charged Ore Mixture
5379	PLNTRD	COMPR	Composite Plant Road Dust
5380	ORDUST	DUSTO	Dust from Ore Crusher
5381	SSCOMP	SSCOM	Composite of Slag Skim 1&2
5382	SPCOMP	SPCOM	Composite of Slag Pour 1&2

Table 13

-Continued-

Code	Mnemonic NEA	Mnemonic EPA	Description
5383	SSPCOM	SSPCO	Composite of Slag Skim 1&2 and Slag Pour 1&2
5384	SMCOMP	SMCOM	Composite of Slag Skim 1&2, Slag Pour 1&2, and Matte Tap 1&2
5385	CONCOM	CONCO	Composite of Secondary Converter Ducting 1, 2 & 3
5386	SMELTC	SMELT	Composite of Slag Skim 1&2, Slag Pour 1&2, Matte Tap 1&2, and Secondary Converter Ducting 1, 2 & 3.

Table 14

SOURCE COMPOSITION PROFILES
FOR REPRESENTATIVE KEY SOURCES AND SPECIES

Fine Fraction (< 2.5 μm), Percent

Element	KNECTT* Road Dust	PLNTRD	ORDUST	SSFF1	MTFF1	2NDCD3
Al	7.083	3.147	10.058	0.000	0.000	0.000
Si	19.872	11.834	37.263	0.000	0.000	0.000
P	0.092	0.046	0.038	0.000	0.000	0.000
S	0.702	8.308	1.046	0.000	0.000	0.000
K	0.794	0.692	3.059	0.398	0.331	0.201
Ca	12.952	1.835	1.404	0.000	0.000	0.000
Ti	0.246	0.143	0.610	0.000	0.000	0.000
Mn	0.089	0.054	0.083	0.015	0.013	0.000
Fe	3.095	9.884	4.970	0.961	2.688	0.035
Ni	0.008	0.077	0.011	0.000	0.000	0.046
Cu	0.743	14.575	0.696	0.203	3.354	0.574
Zn	0.022	1.522	0.032	25.422	9.766	6.932
As	0.000	0.541	0.008	16.496	32.784	7.648
Br	0.003	0.041	0.000	0.000	0.000	0.000
Cd	0.004	0.084	0.000	2.188	1.679	0.874
Sb	0.000	0.000	0.000	1.393	1.991	1.150
Pb	0.035	3.099	0.010	21.160	12.464	25.490

*KNECTT - Kennecott Road Dust
SSFF1 - Slag Skim 1; Flash Furnace
MTFF1 - Matte Tap 1; Flash Furnace
2NDCD3 - Secondary Converter Ducting
PLNTRD - Composite Plant Road Dust
ORDUST - Dust From Ore Crusher

Table 15

SOURCE COMPOSITION PROFILES
FOR REPRESENTATIVE KEY SOURCES AND SPECIES

Coarse Fraction (2.5 μm - 10 μm), Percent

Element	KNECTT* Road Dust	PLNTRD	ORDUST	SSFF1	MTFF1	2NDCD3
Al	5.009	1.682	6.749	0.000	0.000	0.000
Si	15.610	7.852	25.799	3.936	2.189	0.000
P	0.055	0.035	0.000	0.000	0.000	0.000
S	0.607	8.985	0.855	0.000	0.467	0.000
K	0.840	0.715	3.536	0.335	0.583	0.160
Ca	12.673	2.329	1.304	0.000	0.000	0.000
Ti	0.263	0.163	0.999	0.103	0.000	0.000
Mn	0.078	0.035	0.084	0.015	0.042	0.000
Fe	3.109	12.976	5.724	6.457	7.087	0.308
Ni	0.009	0.093	0.011	0.200	0.023	0.000
Cu	0.643	17.464	0.842	6.315	8.423	1.044
Zn	0.018	2.021	0.029	11.147	7.815	5.658
As	0.001	0.395	0.002	11.285	31.833	7.313
Br	0.002	0.000	0.002	0.000	0.000	0.000
Cd	0.000	0.068	0.000	1.147	1.258	0.619
Sb	0.023	0.072	0.000	1.024	2.015	1.433
Pb	0.025	1.949	0.008	11.535	11.600	22.709

*KNECTT - Kennecott Road Dust
SSFF1 - Slag Skim 1; Flash Furnace
MTFF1 - Matte Tap 1; Flash Furnace
2NDCD3 - Secondary Converter Ducting
PLNTRD - Composite Plant Road Dust
ORDUST - Dust From Ore Crusher

Table 16

FINE TO COARSE PARTICLE RATIOS
FOR KEY SOURCES IN THE HAYDEN AIRSHED

Mnemonic	Description	F/C Ratio
CANDRD	Canyon Drive Road Dust	0.078
JPARK	Jailhouse Parking Lot Road Dust	0.046
KNECTT	Kennecott Road Dust	0.050
CUORT	Copper Ore Tailings from Pond	0.093
CUOR	Copper Ore	0.011
SSFF1	Slag Skim; Flash Furnace #1	9.623
MTFF1	Matte Tap; Flash Furnace #1	15.032
MTFF2	Matte Tap; Flash Furnace #2	14.667
SSFF2	Slag Skim; Flash Furnace #2	8.288
2NDCD1	Secondary Converter Ducting #1	18.811
2NDCD2	Secondary Converter Ducting #2	11.497
2NDCD3	Secondary Converter Ducting #3	15.231
SLPR#1	Slag Pour #1	21.608
SLPR#2	Slag Pour #2	18.145
*ORCRBL	Ore Crusher Building	-
CHORMX	Charged Ore Mixture	0.076
PLNTRD	Composite Plant Road Dust	0.076
ORDUST	Dust from Ore Crusher	0.042

*No net mass recorded for coarse fraction

Table 17

RESULTS FOR CMB SITE: HD 715 714 YEAR: 87 DATE: 0104
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9749
CHI SQUARE: 1.3403
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.945+-	.481	5.651+-	1.509
13	KNECT	8.833+-	2.067	25.658+-	6.538
16	SSFF1	.000+-	.000	.000+-	.000
19	SSFF2	.176+-	.032	.510+-	.106
22	2NCD3	.000+-	.000	.000+-	.000
28	DUSTO	22.818+-	2.034	66.280+-	8.917
	TOTAL:	33.772+-	1.855	98.098+-	11.260

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			34.42620+-	3.46960	100.00000+-	14.25297	33.77156+-	1.85531	.98+-	.11	TOTAL
13	AL	*		1.88920+-	.23980	5.48768+-	.88943	1.98253+-	.16024	1.05+-	.16	AL
14	SI	*		9.02600+-	1.01600	26.21840+-	3.96132	7.27240+-	.60461	.81+-	.11	SI
15	P			<	.00000	<	.03340	.00487+-	.00578	.00+-	.00	P
16	S	*		.63590+-	.07620	1.84714+-	.28922	.61063+-	.04299	.96+-	.13	S
17	CL			.02030+-	.00680	.05897+-	.02063	.01752+-	.00308	.86+-	.33	CL
19	K	*		.78350+-	.08870	2.27588+-	.34496	.88214+-	.08102	1.13+-	.16	K
20	CA	*		1.72870+-	.19420	5.02147+-	.75785	1.87016+-	.12443	1.08+-	.14	CA
22	TI	*		.17810+-	.04050	.51734+-	.12868	.25115+-	.02292	1.41+-	.35	TI
23	V			<	.00890	<	.02656	.00505+-	.00194	.57+-	.62	V
24	CR			<	.00000	<	.00203	.00245+-	.00047	.00+-	.00	CR
25	MN	*		.03080+-	.00360	.08947+-	.01381	.02618+-	.00204	.85+-	.12	MN
26	FE	*		1.67830+-	.18880	4.87507+-	.73632	1.59822+-	.13348	.95+-	.13	FE
28	NI			<	.00020	<	.00145	.00320+-	.00246	16.01+-	41.86	NI
29	CU			.68500+-	.07750	1.98976+-	.30149	.26821+-	.01978	.39+-	.05	CU
30	ZN	*		.03000+-	.00540	.08714+-	.01798	.02874+-	.00361	.96+-	.21	ZN
31	GA			<	.00000	<	.00116	.00026+-	.00033	.00+-	.00	GA
33	AS	*		.00960+-	.00350	.02789+-	.01055	.01674+-	.00374	1.74+-	.75	AS
34	SE			.00070+-	.00030	.00203+-	.00090	.00011+-	.00046	.15+-	.66	SE
35	BR	*		.00150+-	.00040	.00436+-	.00124	.00077+-	.00320	.52+-	2.14	BR
37	RB			.00300+-	.00060	.00871+-	.00195	.00497+-	.00044	1.66+-	.36	RB
38	SR			.00790+-	.00100	.02295+-	.00371	.00765+-	.00056	.97+-	.14	SR
39	Y			.00160+-	.00160	.00465+-	.00467	.00165+-	.00033	1.03+-	1.05	Y
40	ZR			<	.00000	<	.00930	.00069+-	.00110	.00+-	.00	ZR
42	MO			.01110+-	.00200	.03224+-	.00666	.00698+-	.00081	.63+-	.13	MO
46	PD			<	.00000	<	.00465	.00000+-	.00063	.00+-	.00	PD
47	AG			<	.00000	<	.00668	.00000+-	.00084	.00+-	.00	AG
48	CD			<	.00000	<	.00842	.00080+-	.00113	.00+-	.00	CD
49	IN			<	.00000	<	.01075	.00089+-	.00134	.00+-	.00	IN
50	SN			<	.00000	<	.01249	.00147+-	.00154	.00+-	.00	SN
51	SB			<	.00000	<	.02643	.00350+-	.00355	.00+-	.00	SB
56	BA			<	.00000	<	.05054	.00000+-	.00667	.00+-	.00	BA
57	LA			<	.00000	<	.09266	.00619+-	.01143	.00+-	.00	LA
80	HG			<	.00000	<	.00087	.00004+-	.00031	.00+-	.00	HG
82	PB		*	.02610+-	.00410	.07581+-	.01415	.02014+-	.00287	.77+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.6+- 1.4 COARSE: 34.4+- 3.5 TOTAL: 48.0+- 3.8

Table 18

AVERAGE SOURCE CONTRIBUTIONS
TO MAJOR SOURCE CATEGORIES

(Percent)

FINE

Source	Site 1	Site 2
Ore Dust	32.3	38.0
Secondary Sulfate	28.2	29.4
Road Dust	8.3	4.2
Process Fugitive	4.6	5.7
Lime and Gypsum	2.8	-0.7
Transportation	1.6	1.7
Charge Ore Mix	1.1	0.5

COARSE

Source	Site 1	Site 2
Ore Dust	48.1	76.8
Road Dust	42.7	3.8
Cu Ore Tailings	-	5.0
Lime and Gypsum	6.8	3.3
Secondary Sulfate	0.7	-
Smelter Yard Dust	-	0.5
Process Fugitive	0.4	0.4
Charge Ore Mix	0.2	< .1

Table 19

AVERAGE PERCENT SOURCE CONTRIBUTIONS
TO PM_{10} MASS, LEAD, ARSENIC, AND CADMIUM CONCENTRATIONS

Source Contribution to:	Secondary Sulfur	Trans	Cu Ore Tailings	Road Dust	Ore Dust	Slag Operations	Matte Operations	Secondary Converter Ducting
Mass								
Site 1	7.43	0.39	0	34.24	44.24	0.57	0.08	0.85
Site 2	4.21	0.22	4.30	4.35	71.22	0.36	0.08	0.69
Pb								
Site 1	0	3.77	0	2.87	1.58	22.06	1.93	61.90
Site 2	0	6.61	0.779	5.36	3.59	21.43	4.43	56.66
As								
Site 1	0	N/A	0	0.37	2.32	44.13	6.82	56.95
Site 2	0	N/A	b	2.45	3.14	35.65	6.63	56.65
Cd[a]								
Site 1	0	0.96	0	0.21	b	45.93	6.96	49.83
Site 2	0	0.29	b	0.17	b	b	21.79	37.39

[a]Values for Cd are based on the fine particle averages since Cd was below detection limits on all coarse particle filters.

[b]Value < 0.0005

Table 20

AVERAGE $\mu g/m^3$ SOURCE CONTRIBUTIONS
TO PM_{10} MASS, LEAD, ARSENIC, AND CADMIUM CONCENTRATIONS

Source Contribution to:	Secondary Sulfur	Trans	Cu Ore Tailings	Road Dust	Ore Dust	Slag Operations	Matte Operations	Secondary Converter Ducting
Mass								
Site 1	4.03	0.19	0	20.71	27.72	0.13	0.05	0.50
Site 2	4.11	0.23	5.29	4.69	73.75	0.25	0.06	0.60
Pb								
Site 1	0	0.0046	0	0.0098	0.0023	0.0491	0.0058	0.1234
Site 2	0	0.0053	0.0010	0.0150	0.0059	0.0042	0.0079	0.1443
As								
Site 1	0	N/A	0	0.0003	0.0009	0.0395	0.0153	0.0393
Site 2	0	N/A	b	0.0026	0.0018	0.0289	0.0208	0.0467
Cd[a]								
Site 1	0	b	0	b	b	0.0055	0.0009	0.0047
Site 2	0	b	b	b	b	b	0.0023	0.0050

[a]Values for Cd are based on the fine particle averages since Cd was below detection limits on all coarse particle filters.

[b]Value < 0.00005

Table 21

SUMMARY OF MAJOR SOURCE IMPACTS AND CMB QUALITY MEASURES
BY METEOROLOGICAL REGIME

Regime No.	Regime Description	Site No.	n	$\bar{X}^2$ F	$\bar{X}^2$ C	% Mass Expl. F	% Mass Expl. C	Fine Impacts ($\mu g/m^3$) O/R Dust	Fine Impacts ($\mu g/m^3$) NH_4SO_4	Fine Impacts ($\mu g/m^3$) Proc.Fug.	Coarse Impacts ($\mu g/m^3$) O.Dust	Coarse Impacts ($\mu g/m^3$) R.Dust	Coarse Impacts ($\mu g/m^3$) CaDust
1	High wind speeds from the east	1	1	4.1	2.9	61	77	1.5	1.7	0.33	19.0	-	2.5
		2	3	5.2	4.2	69	72	4.0	3.2	0.55	83.4	-	1.5
2	Low wind speeds from the south	1	5	4.1	1.7	71	101	2.9	4.5	0.66	8.3	18.3	1.9
		2	4	3.7	2.2	79	99	4.8	4.8	0.60	38.4	2.8	2.2
3	Moderate wind speeds from the southeast	1	5	2.2	2.3	92	103	12.3	3.9	0.69	39.3	22.0	3.0
		2	4	1.5	3.2	95	98	13.3	3.9	0.67	86.4	7.8	1.8
4	Moderate wind speeds from the west	1	1	10.7	2.4	73	88	6.1	3.2	0.32	9.9	28.8	12.2
		2	1	6.2	1.1	71	70	7.0	3.9	0.56	35.4	1.9	1.8
5	Moderate wind speed from the east	2	1	4.2	1.7	76	93	2.1	5.2	0.86	88.8	-	2.1
	STUDY AVERAGE	1	12	3.8	2.1	79	99	7.0	3.9	0.63	22.3	19.3	3.1
		2	13	3.6	2.9	81	90	7.2	4.1	0.05	67.2	3.2	1.9

Table 22

COMPARISON OF FITTING QUALITY PARAMETERS FOR DAYS WHEN SOURCE SAMPLES WERE COLLECTED

Qual. Param.	1/27/87 Regime 3				1/28/87 Regime 2				1/30/87 Regime 3			
	Fine		Coarse		Fine		Coarse		Fine		Coarse	
	HJ	G	HJ	G	HJ	G	HJ	G	HJ	G	HJ	G
R^2	0.98	0.97	0.96	0.96	0.97	0.97	0.97	0.94	0.96	0.99	0.96	0.96
χ^2	1.2	1.7	2.8	2.8	2.2	2.1	1.8	3.2	2.4	0.5	2.1	2.4
χ	76	86	98	107	78	85	105	98	85	89	99	93
DF	7	8	7	7	6	7	8	8	8	7	8	8
Ratios												
Al	1.2 ± .2	1.3 ± .2	0.9 ± .1	1.3 ± .2	1.4 ± .2	1.3 ± .2	1.4 ± .2	1.2 ± .2	1.2 ± .2	0.9 ± .1	1.1 ± .2	1.1 ± .2
Si	1.0 ± .2	1.2 ± .2	0.9 ± .1	0.9 ± .1	1.1 ± .2	1.1 ± .2	1.0 ± .1	0.9 ± .1	1.0 ± .2	1.1 ± .2	1.0 ± .1	1.1 ± .2
K	1.0 ± .2	1.0 ± .1	1.5 ± .2	1.2 ± .2	0.8 ± .1	1.0 ± .2	1.0 ± .1	1.4 ± .2	1.1 ± .2	1.0 ± .2	1.3 ± .2	1.3 ± .2
Ca	1.0 ± .1	1.0 ± .1	1.1 ± .1	1.1 ± .2	1.0 ± .1	1.0 ± .1	1.0 ± .1	1.1 ± .1	1.0 ± .1	1.0 ± .1	1.1 ± .1	0.8 ± .1
Ti	.8 ± .1	0.9 ± .2	1.1 ± .2	1.0 ± .2	0.9 ± .1	0.8 ± .1	0.9 ± .2	1.1 ± .3	0.7 ± .1	0.9 ± .1	1.2 ± .3	1.2 ± .3
Mn	1.3 ± .3	0.6 ± .1	0.6 ± .1	0.7 ± .1	1.3 ± .4	0.6 ± .1	0.9 ± .1	0.6 ± .1	2.3 ± 1.0	1.2 ± .3	0.7 ± .1	0.6 ± .1
Fe	.9 ± .1	0.8 ± .1	0.8 ± .1	0.6 ± .1	0.7 ± .1	1.0 ± .1	0.7 ± .1	0.7 ± .1	0.7 ± .1	1.0 ± .1	0.8 ± .1	0.8 ± .1
Cu	.7 ± .1	0.2 ± .0	0.6 ± .1	0.3 ± .0	0.2 ± .0	1.6 ± .2	0.3 ± .0	0.5 ± .1	0.3 ± .0	1.2 ± .2	0.5 ± .1	0.9 ± .1
Zn	1.1 ± .2	1.1 ± .2	1.1 ± .2	1.1 ± .2	1.0 ± .1	1.0 ± .1	0.9 ± .2	0.9 ± .2	1.1 ± .2	1.0 ± .1	0.9 ± .2	0.9 ± .1
As	.7 ± .2	1.0 ± .2	1.2 ± .7	1.0 ± .5	1.0 ± .2	0.7 ± .2	1.2 ± .3	1.6 ± .5	0.7 ± .2	0.8 ± .2	1.8 ± .6	1.1 ± .3
Br	.1 ± 1.0	-	-	2 ± 10	3 ± 8	0.1 ± 2	0 ± 0	0 ± 0	0 ± 2	0.2 ± 4.6	0.2 ± 1.5	0 ± 0
Pb	1.0 ± .2	0.9 ± .1	1.0 ± .2	1.0 ± .2	1.0 ± .1	1.1 ± .2	1.0 ± .2	0.9 ± .2	1.0 ± .2	1.1 ± .2	0.8 ± .2	1.0 ± .2

APPENDIX B

CHEMICAL MASS BALANCE
SOURCE IMPACT RESULTS AND ELEMENTAL COMPOSITION
FROM EPA CMB RECEPTOR MODEL VERSION 5.9

RESULTS FOR CMB SITE: HD 591 590 YEAR: 86 DATE: 1122
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .8219
CHI SQUARE: 10.7223
DF: 8

#	TYPE	UG/M3		%	
5	5095	3.191+-	.428	22.242+-	3.773
10	TRANS	.884+-	.455	6.159+-	3.232
13	KNECT	6.094+-	.416	42.470+-	5.282
22	2NCD3	.324+-	.050	2.260+-	.422
	TOTAL:	10.493+-	.662	73.132+-	8.889

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			14.34820+-	1.49100	100.00000+-	14.69587	10.49308+-	.66170	.73+-	.09	TOTAL
13	AL	*		.32860+-	.04330	2.29018+-	.38433	.43668+-	.04319	1.33+-	.22	AL
14	SI	*		2.43060+-	.27610	16.94010+-	2.60800	1.21457+-	.12112	.50+-	.08	SI
15	P			.01030+-	.00900	.07179+-	.06317	.00631+-	.00202	.61+-	.57	P
16	S	*		.83800+-	.09590	5.84045+-	.90281	.83800+-	.03356	1.00+-	.12	S
17	CL			.03760+-	.00640	.26205+-	.05226	.02457+-	.00378	.65+-	.15	CL
19	K	*		.23920+-	.02730	1.66711+-	.25732	.04957+-	.00484	.21+-	.03	K
20	CA	*		.76650+-	.08610	5.34213+-	.81747	.79620+-	.07895	1.04+-	.16	CA
22	TI	*		.01860+-	.00230	.12963+-	.02094	.01506+-	.00150	.81+-	.13	TI
23	V			<	.00000	<	.00348	.00142+-	.00027	.00+-	.00	V
24	CR			<	.00000	<	.00348	.00090+-	.00015	.00+-	.00	CR
25	MN	*		.00190+-	.00070	.01324+-	.00507	.00555+-	.00055	2.92+-	1.11	MN
26	FE	*		.22050+-	.02490	1.53678+-	.23584	.19487+-	.01901	.88+-	.13	FE
28	NI			.00070+-	.00030	.00488+-	.00215	.00070+-	.00012	1.00+-	.46	NI
29	CU			.18620+-	.02100	1.29772+-	.19901	.04799+-	.00455	.26+-	.04	CU
30	ZN	*		.02930+-	.00350	.20421+-	.03233	.02775+-	.00256	.95+-	.14	ZN
31	GA			.00050+-	.00050	.00348+-	.00350	.00036+-	.00028	.73+-	.92	GA
33	AS	*		.02220+-	.00640	.15472+-	.04741	.02481+-	.00472	1.12+-	.39	AS
34	SE			.00350+-	.00060	.02439+-	.00489	.00020+-	.00052	.06+-	.15	SE
35	BR	*		.00600+-	.00110	.04182+-	.00881	.00531+-	.00259	.88+-	.46	BR
37	RB			<	.00030	<	.00419	.00051+-	.00012	1.71+-	3.43	RB
38	SR			.00190+-	.00070	.01324+-	.00507	.00175+-	.00018	.92+-	.35	SR
39	Y			<	.00000	<	.00627	.00083+-	.00031	.00+-	.00	Y
40	ZR			<	.00000	<	.02370	.00057+-	.00083	.00+-	.00	ZR
42	MO			<	.00000	<	.01673	.00011+-	.00045	.00+-	.00	MO
46	PD			<	.00000	<	.01533	.00077+-	.00051	.00+-	.00	PD
47	AG			<	.00000	<	.01951	.00032+-	.00064	.00+-	.00	AG
48	CD			<	.00000	<	.02718	.00321+-	.00089	.00+-	.00	CD
49	IN			<	.00000	<	.03276	.00013+-	.00111	.00+-	.00	IN
50	SN			<	.00000	<	.03903	.00111+-	.00142	.00+-	.00	SN
51	SB			<	.00000	<	.08433	.00382+-	.00276	.00+-	.00	SB
56	BA			<	.00000	<	.15890	.00393+-	.00526	.00+-	.00	BA
57	LA			<	.00000	<	.28645	.01553+-	.00981	.00+-	.00	LA
80	HG			<	.00010	<	.00279	.00014+-	.00014	1.40+-	5.78	HG
82	PB	*		.10260+-	.01170	.71507+-	.11032	.10545+-	.01005	1.03+-	.15	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 14.3+- 1.5 COARSE: 56.5+- 5.7 TOTAL: 70.9+- 5.9

RESULTS FOR CMB SITE: HD 591 590 YEAR: 86 DATE: 1122
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9622
CHI SQUARE: 2.3791
DF: 7

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
6	CAO	6.737+-	2.032	11.920+-	3.790
7	GYPSU	4.441+-	.818	7.858+-	1.649
10	TRANS	.000+-	.000	.000+-	.000
13	KNECT	28.773+-	6.083	50.909+-	11.916
22	2NCD3	.000+-	.000	.000+-	.000
28	DUSTO	9.944+-	3.078	17.595+-	5.725
33	CONCO	.049+-	.013	.086+-	.025
	TOTAL:	49.944+-	3.213	88.368+-	10.538

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			56.51830+-	5.67470	100.00000+-	14.19936	49.94395+-	3.21310	.88+-	.11	TOTAL
13	AL		*	1.49140+-	.19240	2.63879+-	.43137	2.11253+-	.15898	1.42+-	.21	AL
14	SI		*	8.07220+-	.90900	14.28245+-	2.15480	7.05697+-	.51725	.87+-	.12	SI
15	P			.19460+-	.05830	.34431+-	.10879	.01585+-	.00481	.08+-	.03	P
16	S		*	1.08580+-	.12500	1.92115+-	.29347	1.08580+-	.08488	1.00+-	.14	S
17	CL			.02620+-	.01270	.04636+-	.02295	.05709+-	.00580	2.18+-	1.08	CL
19	K		*	.62870+-	.07250	1.11238+-	.17009	.59342+-	.04267	.94+-	.13	K
20	CA		*	9.59390+-	1.07610	16.97486+-	2.55538	9.59390+-	.61043	1.00+-	.13	CA
22	TI		*	.14250+-	.03220	.25213+-	.06234	.17498+-	.01249	1.23+-	.29	TI
23	V			<	.01000	<	.01796	.00711+-	.00126	.71+-	.73	V
24	CR			<	.00000	<	.00124	.00471+-	.00047	.00+-	.00	CR
25	MN		*	.03480+-	.00400	.06157+-	.00940	.03077+-	.00239	.88+-	.12	MN
26	FE		*	1.81920+-	.20450	3.21878+-	.48515	1.46385+-	.10603	.80+-	.11	FE
28	NI			<	.00000	<	.00106	.00354+-	.00110	.00+-	.00	NI
29	CU			1.19230+-	.13410	2.10958+-	.31806	.26763+-	.02023	.22+-	.03	CU
30	ZN		*	.01470+-	.00800	.02601+-	.01439	.01211+-	.00118	.82+-	.46	ZN
31	GA			<	.00000	<	.00071	.00086+-	.00016	.00+-	.00	GA
33	AS		*	<	.00000	<	.00460	.00574+-	.00138	.00+-	.00	AS
34	SE			<	.00000	<	.00053	.00035+-	.00013	.00+-	.00	SE
35	BR		*	<	.00000	<	.00088	.00091+-	.00064	.00+-	.00	BR
37	RB			.00230+-	.00060	.00407+-	.00114	.00384+-	.00028	1.67+-	.45	RB
38	SR			.01850+-	.00240	.03273+-	.00537	.01158+-	.00097	.63+-	.10	SR
39	Y			<	.00000	<	.00142	.00237+-	.00029	.00+-	.00	Y
40	ZR			<	.00000	<	.00602	.00225+-	.00121	.00+-	.00	ZR
42	MO			.02060+-	.00340	.03645+-	.00704	.00282+-	.00074	.14+-	.04	MO
46	PD			<	.00000	<	.00354	.00000+-	.00071	.00+-	.00	PD
47	AG			<	.00000	<	.00442	.00002+-	.00090	.00+-	.00	AG
48	CD			<	.00000	<	.00602	.00040+-	.00118	.00+-	.00	CD
49	IN			<	.00000	<	.00725	.00138+-	.00138	.00+-	.00	IN
50	SN			<	.00000	<	.00885	.00217+-	.00168	.00+-	.00	SN
51	SB			<	.00000	<	.01911	.00727+-	.00385	.00+-	.00	SB
56	BA			<	.00000	<	.03574	.00000+-	.00728	.00+-	.00	BA
57	LA			<	.00000	<	.06529	.02017+-	.01250	.00+-	.00	LA
80	HG			<	.00000	<	.00071	.00014+-	.00014	.00+-	.00	HG
82	PB		*	.02600+-	.00380	.04600+-	.00816	.02211+-	.00160	.85+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 14.3+- 1.5 COARSE: 56.5+- 5.7 TOTAL: 70.9+- 5.9

RESULTS FOR CMB SITE: MD 59' 59C YEAR: 86 DATE: 1122
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9622
CHI SQUARE: 2.3791
DF: 7

#	TYPE	UG/M3		%	
5	5095	3.191+-	.428	4.503+-	.710
6	CAO	6.737+-	2.032	9.506+-	2.974
7	GYPSU	4.441+-	.818	6.267+-	1.266
10	TRANS	.884+-	.455	1.247+-	.650
13	KNECT	34.867+-	6.098	49.200+-	9.520
22	2NCD3	.324+-	.050	.457+-	.080
28	DUSTO	9.944+-	3.078	14.032+-	4.495
33	CONCO	.049+-	.013	.069+-	.019
	TOTAL:	60.437+-	3.281	85.283+-	8.443

	SPECIES	INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			70.86650+-	5.86731	100.00000+-	11.70881	60.43703+-	3.28053	.85+-	.08	TOTAL
13	AL	*		1.82000+-	.19721	2.56821+-	.35022	2.54921+-	.16475	1.40+-	.18	AL
14	SI	*		10.50280+-	.95001	14.82054+-	1.81735	8.27154+-	.53125	.79+-	.09	SI
15	P			.20490+-	.05899	.28914+-	.08662	.02217+-	.00521	.11+-	.04	P
16	S	*		1.92380+-	.15755	2.71468+-	.31614	1.92380+-	.09127	1.00+-	.09	S
17	CL			.06380+-	.01422	.09003+-	.02141	.08165+-	.00692	1.28+-	.31	CL
19	K	*		.86790+-	.07747	1.22470+-	.14910	.64299+-	.04294	.74+-	.08	K
20	CA	*		10.36040+-	1.07954	14.61960+-	1.94568	10.39010+-	.61551	1.00+-	.12	CA
22	TI	*		.16110+-	.03228	.22733+-	.04929	.19004+-	.01258	1.18+-	.25	TI
23	V			<	.01000	<	.01432	.00853+-	.00129	.85+-	.87	V
24	CR			<	.00000	<	.00121	.00560+-	.00049	.00+-	.00	CR
25	MN	*		.03670+-	.00406	.05179+-	.00716	.03632+-	.00246	.99+-	.13	MN
26	FE	*		2.03970+-	.20601	2.87823+-	.37589	1.65872+-	.10772	.81+-	.10	FE
28	NI			.00070+-	.00067	.00099+-	.00095	.00424+-	.00110	6.06+-	6.02	NI
29	CU			1.37850+-	.13573	1.94521+-	.25025	.31561+-	.02074	.23+-	.03	CU
30	ZN	*		.04400+-	.00873	.06209+-	.01335	.03986+-	.00282	.91+-	.19	ZN
31	GA			<	.00050	<	.00091	.00123+-	.00032	2.45+-	3.21	GA
33	AS	*		.02220+-	.00691	.03133+-	.01009	.03055+-	.00492	1.38+-	.48	AS
34	SE			.00350+-	.00067	.00494+-	.00103	.00055+-	.00054	.16+-	.16	SE
35	BR	*		.00600+-	.00121	.00847+-	.00184	.00622+-	.00266	1.04+-	.49	BR
37	RB			.00260+-	.00085	.00367+-	.00124	.00435+-	.00030	1.67+-	.56	RB
38	SR			.02040+-	.00250	.02879+-	.00426	.01334+-	.00099	.65+-	.09	SR
39	Y			<	.00000	<	.00170	.00319+-	.00043	.00+-	.00	Y
40	ZR			<	.00000	<	.00679	.00282+-	.00146	.00+-	.00	ZR
42	MO			.02060+-	.00416	.02907+-	.00635	.00293+-	.00087	.14+-	.05	MO
46	PD			<	.00000	<	.00420	.00077+-	.00087	.00+-	.00	PD
47	AG			<	.00000	<	.00530	.00034+-	.00111	.00+-	.00	AG
48	CD			<	.00000	<	.00730	.00361+-	.00148	.00+-	.00	CD
49	IN			<	.00000	<	.00880	.00151+-	.00177	.00+-	.00	IN
50	SN			<	.00000	<	.01059	.00328+-	.00220	.00+-	.00	SN
51	SB			<	.00000	<	.02289	.01109+-	.00473	.00+-	.00	SB
56	BA			<	.00000	<	.04298	.00393+-	.00898	.00+-	.00	BA
57	LA			<	.00000	<	.07794	.03570+-	.01589	.00+-	.00	LA
80	HG			<	.00010	<	.00080	.00028+-	.00020	2.84+-	16.19	HG
82	PB	*		.12860+-	.01230	.18147+-	.02296	.12757+-	.01018	.99+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 14.3+- 1.5 COARSE: 56.5+- 5.7 TOTAL: 70.9+- 5.9

RESULTS FOR CMB SITE: GR 595 594 YEAR: 86 DATE: 1122
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .8999
CHI SQUARE: 6.1645
DF: 8

#	TYPE	UG/M3		%	
5	5095	3.880+-	.505	23.989+-	3.986
13	KNECT	.784+-	.226	4.849+-	1.482
28	DUSTO	6.192+-	.495	38.286+-	4.996
33	CONCO	.563+-	.059	3.480+-	.510
	TOTAL:	11.419+-	.655	70.604+-	8.330

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			16.17290+-	1.66740	100.00000+-	14.58032	11.41870+-	.65502	.71+-	.08	TOTAL
13	AL		*	.52740+-	.06810	3.26101+-	.53883	.67831+-	.06253	1.29+-	.20	AL
14	SI		*	3.90100+-	.44180	24.12060+-	3.69412	2.46313+-	.23126	.63+-	.09	SI
15	P			<	.04100	<	.25608	.00309+-	.00242	.08+-	.10	P
16	S		*	1.00140+-	.11440	6.19184+-	.95282	1.00140+-	.04011	1.00+-	.12	S
17	CL			.01760+-	.00530	.10882+-	.03464	.00147+-	.00164	.08+-	.10	CL
19	K		*	.41120+-	.04650	2.54252+-	.38907	.19636+-	.01895	.48+-	.07	K
20	CA		*	.20260+-	.02310	1.25271+-	.19256	.18849+-	.01339	.93+-	.12	CA
22	TI		*	.03850+-	.00450	.23805+-	.03710	.03971+-	.00378	1.03+-	.16	TI
23	V			<	.00030	<	.00433	.00072+-	.00052	2.39+-	5.84	V
24	CR			<	.00000	<	.00309	.00034+-	.00017	.00+-	.00	CR
25	MN		*	.00300+-	.00080	.01855+-	.00530	.00586+-	.00052	1.95+-	.55	MN
26	FE		*	.31610+-	.03560	1.95450+-	.29843	.33221+-	.03086	1.05+-	.15	FE
28	NI			.00140+-	.00040	.00866+-	.00263	.00078+-	.00068	.56+-	.51	NI
29	CU			.12370+-	.01400	.76486+-	.11710	.05174+-	.00436	.42+-	.06	CU
30	ZN		*	.04600+-	.00530	.28443+-	.04398	.04297+-	.00409	.93+-	.14	ZN
31	GA			.00070+-	.00060	.00433+-	.00374	.00017+-	.00021	.24+-	.37	GA
33	AS		*	.02470+-	.00880	.15272+-	.05664	.04119+-	.00468	1.67+-	.62	AS
34	SE			.00250+-	.00050	.01546+-	.00348	.00003+-	.00034	.01+-	.13	SE
35	BR		*	.00650+-	.00130	.04019+-	.00904	.00003+-	.00202	.00+-	.31	BR
37	RB			<	.00020	<	.00371	.00070+-	.00014	3.52+-	10.58	RB
38	SR			.00180+-	.00070	.01113+-	.00448	.00127+-	.00017	.71+-	.29	SR
39	Y			<	.00030	<	.00619	.00079+-	.00032	2.63+-	8.82	Y
40	ZR			<	.00000	<	.02226	.00015+-	.00085	.00+-	.00	ZR
42	MO			<	.00000	<	.01608	.00028+-	.00048	.00+-	.00	MO
46	PD			<	.00000	<	.01422	.00010+-	.00051	.00+-	.00	PD
47	AG			<	.00000	<	.01855	.00030+-	.00058	.00+-	.00	AG
48	CD			.01270+-	.00440	.07853+-	.02839	.00358+-	.00093	.28+-	.12	CD
49	IN			<	.00000	<	.03092	.00020+-	.00109	.00+-	.00	IN
50	SN			<	.00000	<	.03772	.00171+-	.00129	.00+-	.00	SN
51	SB			<	.00000	<	.08038	.00623+-	.00274	.00+-	.00	SB
56	BA			<	.00000	<	.15087	.00042+-	.00505	.00+-	.00	BA
57	LA			<	.00000	<	.28133	.00200+-	.00996	.00+-	.00	LA
80	HG			<	.00010	<	.00247	.00002+-	.00018	.18+-	1.91	HG
82	PB		*	.14710+-	.01670	.90955+-	.13948	.13350+-	.01326	.91+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 16.2+- 1.7 COARSE: 56.0+- 5.6 TOTAL: 72.2+- 5.9

RESULTS FOR THE SITE: GR 595 59- YEAR: 86 DATE: 1122
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9815
CHI SQUARE: 1.0982
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.774+-	.537	3.165+-	1.009
11	CANDR	1.941+-	.539	3.463+-	1.022
13	KNECT	.000+-	.000	.000+-	.000
28	DUSTO	35.368+-	5.107	63.106+-	11.096
33	CONCO	.034+-	.024	.061+-	.044
	TOTAL:	39.117+-	4.791	69.796+-	11.051

	SPECIES	INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			56.04480+-	5.62320	100.00000+-	14.18937	39.11676+-	4.79109	.70+-	.11	TOTAL
13	AL	*		3.44460+-	.43040	6.14615+-	.98491	3.78783+-	.27676	1.10+-	.16	AL
14	SI	*		16.42290+-	1.84600	29.30316+-	4.41512	13.45384+-	1.00994	.82+-	.11	SI
15	P			<	.00870	<	.04000	.01948+-	.00950	2.24+-	5.87	P
16	S	*		.76800+-	.09020	1.37033+-	.21168	.77735+-	.04706	1.01+-	.13	S
17	CL			.06260+-	.01060	.11170+-	.02198	.02593+-	.00454	.41+-	.10	CL
19	K	*		1.86240+-	.20970	3.32306+-	.50116	1.53984+-	.12836	.83+-	.12	K
20	CA	*		1.73560+-	.19510	3.09681+-	.46661	1.70068+-	.10326	.98+-	.13	CA
22	TI	*		.30010+-	.06780	.53546+-	.13237	.41997+-	.03596	1.40+-	.34	TI
23	V			<	.01780	<	.03210	.00847+-	.00318	.48+-	.51	V
24	CR			<	.00000	<	.00178	.00559+-	.00077	.00+-	.00	CR
25	MN	*		.05170+-	.00590	.09225+-	.01402	.04673+-	.00342	.90+-	.12	MN
26	FE	*		2.54170+-	.28550	4.53512+-	.68305	2.80885+-	.21711	1.11+-	.15	FE
28	NI			.00260+-	.00070	.00464+-	.00133	.00666+-	.00380	2.56+-	1.61	NI
29	CU			.70580+-	.07940	1.25935+-	.18983	.44892+-	.03310	.64+-	.09	CU
30	ZN	*		.03060+-	.00510	.05460+-	.01062	.03243+-	.00253	1.06+-	.19	ZN
31	GA			<	.00000	<	.00071	.00064+-	.00025	.00+-	.00	GA
33	AS	*		.00850+-	.00380	.01517+-	.00695	.00701+-	.00158	.82+-	.41	AS
34	SE			<	.00000	<	.00054	.00030+-	.00017	.00+-	.00	SE
35	BR	*		<	.00000	<	.00089	.00191+-	.00098	.00+-	.00	BR
37	RB			.00690+-	.00110	.01231+-	.00232	.00902+-	.00071	1.31+-	.23	RB
38	SR			.01180+-	.00160	.02105+-	.00355	.01538+-	.00110	1.30+-	.20	SR
39	Y			<	.00000	<	.00161	.00292+-	.00047	.00+-	.00	Y
40	ZR			<	.00000	<	.00571	.00175+-	.00181	.00+-	.00	ZR
42	MO			.03570+-	.00490	.06370+-	.01083	.00990+-	.00131	.28+-	.05	MO
46	PD			<	.00000	<	.00357	.00026+-	.00101	.00+-	.00	PD
47	AG			<	.00000	<	.00464	.00001+-	.00139	.00+-	.00	AG
48	CD			<	.00000	<	.00625	.00028+-	.00178	.00+-	.00	CD
49	IN			<	.00000	<	.00696	.00186+-	.00219	.00+-	.00	IN
50	SN			<	.00000	<	.00856	.00015+-	.00250	.00+-	.00	SN
51	SB			<	.00000	<	.01927	.00147+-	.00566	.00+-	.00	SB
56	BA			<	.00000	<	.03497	.00000+-	.01096	.00+-	.00	BA
57	LA			<	.00000	<	.06209	.00834+-	.01869	.00+-	.00	LA
80	HG			<	.00000	<	.00071	.00013+-	.00023	.00+-	.00	HG
82	PB	*		.03230+-	.00490	.05763+-	.01048	.03271+-	.00234	1.01+-	.17	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 16.2+- 1.7 COARSE: 56.0+- 5.6 TOTAL: 72.2+- 5.9

RESULTS FOR CMB SITE: GR 595 594 YEAR: 86 DATE: 1122
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9815
CHI SQUARE: 1.0982
DF: 8

#	TYPE	UG/M3		%	
5	5095	3.880+-	.505	5.372+-	.825
7	GYPSU	1.774+-	.537	2.457+-	.769
11	CANDR	1.941+-	.539	2.687+-	.777
13	KNECT	.784+-	.226	1.086+-	.325
28	DUSTO	41.560+-	5.131	57.548+-	8.504
33	CONCO	.597+-	.063	.827+-	.111
	TOTAL:	50.535+-	4.836	69.977+-	8.783

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			72.21770+-	5.86520	100.00000+-	11.48562	50.53545+-	4.83566	.70+-	.09	TOTAL
13	AL	*		3.97200+-	.43575	5.50004+-	.75074	4.46614+-	.28374	1.12+-	.14	AL
14	SI	*		20.32390+-	1.89813	28.14255+-	3.48314	15.91697+-	1.03608	.78+-	.09	SI
15	P			.04970+-	.04690	.06882+-	.06518	.02256+-	.00980	.45+-	.47	P
16	S	*		1.76940+-	.14568	2.45009+-	.28335	1.77875+-	.06184	1.01+-	.09	S
17	CL			.08020+-	.01185	.11105+-	.01873	.02739+-	.00482	.34+-	.08	CL
19	K	*		2.27360+-	.21479	3.14826+-	.39222	1.73619+-	.12975	.76+-	.09	K
20	CA	*		1.93820+-	.19646	2.68383+-	.34859	1.88917+-	.10412	.97+-	.11	CA
22	TI	*		.33860+-	.06795	.46886+-	.10150	.45968+-	.03615	1.36+-	.29	TI
23	V			.01810+-	.01791	.02506+-	.02489	.00919+-	.00322	.51+-	.53	V
24	CR			<	.00000	<	.00155	.00593+-	.00079	.00+-	.00	CR
25	MN	*		.05470+-	.00595	.07574+-	.01029	.05259+-	.00346	.96+-	.12	MN
26	FE	*		2.85780+-	.28771	3.95720+-	.51187	3.14106+-	.21929	1.10+-	.13	FE
28	NI			.00400+-	.00081	.00554+-	.00120	.00744+-	.00386	1.86+-	1.03	NI
29	CU			.82950+-	.08062	1.14861+-	.14549	.50066+-	.03339	.60+-	.07	CU
30	ZN	*		.07660+-	.00736	.10607+-	.01334	.07539+-	.00481	.98+-	.11	ZN
31	GA			<	.00070	<	.00100	.00081+-	.00033	1.16+-	1.28	GA
33	AS	*		.03320+-	.00959	.04597+-	.01379	.04820+-	.00494	1.45+-	.44	AS
34	SE			.00250+-	.00058	.00346+-	.00085	.00032+-	.00038	.13+-	.15	SE
35	BR	*		.00650+-	.00139	.00900+-	.00206	.00194+-	.00225	.30+-	.35	BR
37	RB			.00710+-	.00125	.00983+-	.00191	.00973+-	.00072	1.37+-	.26	RB
38	SR			.01360+-	.00175	.01883+-	.00286	.01665+-	.00111	1.22+-	.18	SR
39	Y			<	.00030	<	.00186	.00370+-	.00057	12.35+-	55.41	Y
40	ZR			<	.00000	<	.00667	.00189+-	.00200	.00+-	.00	ZR
42	MO			.03570+-	.00555	.04943+-	.00867	.01018+-	.00140	.29+-	.06	MO
46	PD			<	.00000	<	.00422	.00036+-	.00113	.00+-	.00	PD
47	AG			<	.00000	<	.00550	.00031+-	.00151	.00+-	.00	AG
48	CD			.01270+-	.00562	.01759+-	.00792	.00386+-	.00201	.30+-	.21	CD
49	IN			<	.00000	<	.00878	.00207+-	.00245	.00+-	.00	IN
50	SN			<	.00000	<	.01075	.00187+-	.00281	.00+-	.00	SN
51	SB			<	.00000	<	.02340	.00770+-	.00629	.00+-	.00	SB
56	BA			<	.00000	<	.04334	.00042+-	.01207	.00+-	.00	BA
57	LA			<	.00000	<	.07932	.01034+-	.02118	.00+-	.00	LA
80	HG			<	.00010	<	.00078	.00015+-	.00029	1.50+-	8.97	HG
82	PB		*	.17940+-	.01740	.24842+-	.03143	.16621+-	.01347	.93+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 16.2+- 1.7 COARSE: 56.0+- 5.6 TOTAL: 72.2+- 5.9

RESULTS FOR CMB SITE: HC 597 596 YEAR: 86 DATE: 1201
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9775
CHI SQUARE: 1.4178
DF: 8

#	TYPE	UG/M3		%	
5	5095	4.375+-	.625	18.491+-	3.241
13	KNECT	2.307+-	.572	9.751+-	2.613
22	2NCD3	1.030+-	.106	4.355+-	.629
28	DUSTO	14.706+-	1.099	62.158+-	7.839
	TOTAL:	22.419+-	1.115	94.755+-	10.718

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			23.65960+-	2.40390	100.00000+-	14.36892	22.41861+-	1.11471	.95+-	.11	TOTAL
13	AL	*		1.14370+-	.14480	4.83398+-	.78472	1.64251+-	.14882	1.44+-	.22	AL
14	SI	*		6.31530+-	.71550	26.69234+-	4.06209	5.93840+-	.54997	.94+-	.14	SI
15	P			<	.05900	<	.25192	.00775+-	.00631	.13+-	.17	P
16	S	*		1.22000+-	.14000	5.15647+-	.79033	1.22000+-	.05271	1.00+-	.12	S
17	CL			.01690+-	.00640	.07143+-	.02801	.00431+-	.00467	.26+-	.29	CL
19	K	*		.53700+-	.06050	2.26969+-	.34434	.47017+-	.04501	.88+-	.13	K
20	CA	*		.51590+-	.05810	2.18051+-	.33074	.50526+-	.03648	.98+-	.13	CA
22	TI	*		.12020+-	.01360	.50804+-	.07726	.09540+-	.00899	.79+-	.12	TI
23	V			.00210+-	.00150	.00888+-	.00640	.00181+-	.00123	.86+-	.85	V
24	CR			.00060+-	.00060	.00254+-	.00255	.00087+-	.00042	1.45+-	1.61	CR
25	MN	*		.01570+-	.00190	.06636+-	.01049	.01431+-	.00124	.91+-	.14	MN
26	FE	*		.75750+-	.08500	3.20166+-	.48465	.80261+-	.07342	1.06+-	.15	FE
28	NI			.00450+-	.00070	.01902+-	.00353	.00227+-	.00162	.51+-	.37	NI
29	CU			.64800+-	.07260	2.73885+-	.41424	.12543+-	.01039	.19+-	.03	CU
30	ZN	*		.07410+-	.00900	.31319+-	.04959	.07666+-	.00718	1.03+-	.16	ZN
31	GA			.00250+-	.00100	.01057+-	.00436	.00046+-	.00088	.18+-	.36	GA
33	AS	*		.10250+-	.01830	.43323+-	.08899	.08001+-	.01498	.78+-	.20	AS
34	SE			.01450+-	.00180	.06129+-	.00983	.00007+-	.00164	.01+-	.11	SE
35	BR	*		.00560+-	.00240	.02367+-	.01043	.00008+-	.00610	.01+-	1.09	BR
37	RB			.00160+-	.00060	.00676+-	.00263	.00171+-	.00033	1.07+-	.45	RB
38	SR			.00310+-	.00080	.01310+-	.00363	.00314+-	.00041	1.01+-	.29	SR
39	Y			<	.00020	<	.00507	.00224+-	.00094	11.21+-	67.41	Y
40	ZR			<	.00000	<	.01479	.00035+-	.00204	.00+-	.00	ZR
42	MO			.01370+-	.00290	.05790+-	.01360	.00034+-	.00115	.02+-	.08	MO
46	PD			<	.00000	<	.00972	.00029+-	.00122	.00+-	.00	PD
47	AG			<	.00000	<	.01310	.00063+-	.00139	.00+-	.00	AG
48	CD			.01180+-	.00420	.04987+-	.01846	.00909+-	.00224	.77+-	.33	CD
49	IN			<	.00000	<	.02029	.00041+-	.00259	.00+-	.00	IN
50	SN			<	.00000	<	.02494	.00352+-	.00308	.00+-	.00	SN
51	SB			<	.00000	<	.05621	.01185+-	.00651	.00+-	.00	SB
56	BA			<	.00000	<	.09890	.00122+-	.01205	.00+-	.00	BA
57	LA			<	.00000	<	.17879	.00588+-	.02376	.00+-	.00	LA
80	HG			.00080+-	.00050	.00338+-	.00214	.00005+-	.00041	.07+-	.52	HG
82	PB	*		.25450+-	.02870	1.07567+-	.16328	.26495+-	.02627	1.04+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 23.7+- 2.4 COARSE: 75.6+- 7.6 TOTAL: 99.3+- 7.9

RESULTS FOR CMB SITE: HD 597 596 YEAR: 86 DATE: 1201
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9638
CHI SQUARE: 1.9710
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	2.584+-	.839	3.417+-	1.162
13	KNECT	23.550+-	4.723	31.144+-	6.982
16	SSFF1	.238+-	.046	.315+-	.068
22	2NCD3	.000+-	.000	.000+-	.000
28	DUSTO	56.223+-	4.963	74.352+-	9.927
	TOTAL:	82.595+-	4.612	109.228+-	12.526

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			75.61700+-	7.57370	100.00000+-	14.16458	82.59486+-	4.61227	1.09+-	.13	TOTAL
13	AL	*		4.16970+-	.52010	5.51424+-	.88211	4.97442+-	.39737	1.19+-	.18	AL
14	SI	*		20.13550+-	2.26600	26.62827+-	4.01164	18.19066+-	1.49636	.90+-	.13	SI
15	P			<	.00400	<	.03359	.01298+-	.01417	3.24+-	20.90	P
16	S	*		1.13530+-	.13210	1.50138+-	.23050	1.10445+-	.06999	.97+-	.13	S
17	CL			.03930+-	.01250	.05197+-	.01733	.04672+-	.00764	1.19+-	.43	CL
19	K	*		1.76020+-	.19860	2.32778+-	.35119	2.18662+-	.19979	1.24+-	.18	K
20	CA	*		3.99110+-	.44790	5.27805+-	.79392	4.31950+-	.31319	1.08+-	.14	CA
22	TI	*		.58400+-	.13280	.77231+-	.19190	.62377+-	.05651	1.07+-	.26	TI
23	V			<	.02780	<	.03734	.01352+-	.00479	.49+-	.52	V
24	CR			<	.00000	<	.00185	.00666+-	.00113	.00+-	.00	CR
25	MN	*		.10750+-	.01220	.14216+-	.02152	.06575+-	.00507	.61+-	.08	MN
26	FE	*		4.43690+-	.49850	5.86760+-	.88317	3.96561+-	.33005	.89+-	.12	FE
28	NI			.00240+-	.00100	.00317+-	.00136	.00852+-	.00602	3.55+-	2.91	NI
29	CU			1.41070+-	.15950	1.86559+-	.28179	.62991+-	.04876	.45+-	.06	CU
30	ZN	*		.04560+-	.00900	.06030+-	.01335	.04680+-	.00589	1.03+-	.24	ZN
31	GA			<	.00000	<	.00079	.00071+-	.00058	.00+-	.00	GA
33	AS	*		.02540+-	.00600	.03359+-	.00862	.02828+-	.00630	1.11+-	.36	AS
34	SE			<	.00000	<	.00053	.00028+-	.00060	.00+-	.00	SE
35	BR	*		<	.00000	<	.00079	.00195+-	.00594	.00+-	.00	BR
37	RB			.00880+-	.00130	.01164+-	.00208	.01237+-	.00108	1.41+-	.24	RB
38	SR			.02220+-	.00280	.02936+-	.00473	.01943+-	.00141	.88+-	.13	SR
39	Y			<	.00000	<	.00132	.00417+-	.00077	.00+-	.00	Y
40	ZR			<	.00000	<	.00503	.00184+-	.00271	.00+-	.00	ZR
42	MO			.02890+-	.00440	.03822+-	.00697	.01662+-	.00199	.58+-	.11	MO
46	PD			<	.00000	<	.00304	.00000+-	.00156	.00+-	.00	PD
47	AG			<	.00000	<	.00370	.00000+-	.00208	.00+-	.00	AG
48	CD			<	.00000	<	.00529	.00273+-	.00284	.00+-	.00	CD
49	IN			<	.00000	<	.00608	.00111+-	.00332	.00+-	.00	IN
50	SN			<	.00000	<	.00741	.00221+-	.00377	.00+-	.00	SN
51	SB			<	.00000	<	.01521	.00776+-	.00870	.00+-	.00	SB
56	BA			<	.00000	<	.02949	.00000+-	.01657	.00+-	.00	BA
57	LA			<	.00000	<	.05250	.01651+-	.02839	.00+-	.00	LA
80	HG			<	.00000	<	.00066	.00012+-	.00068	.00+-	.00	HG
82	PB	*		.04070+-	.00650	.05382+-	.01015	.03772+-	.00470	.93+-	.19	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 23.7+- 2.4 COARSE: 75.6+- 7.6 TOTAL: 99.3+- 7.9

RESULTS FOR CME SITE: MI 597 5yc YEAR: 8c DATE: 120
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9638
CHI SQUARE: 1.9710
DF: 8

#	TYPE	UG/M3		%	
5	5095	4.375+-	.625	4.407+-	.721
7	GYPSU	2.584+-	.839	2.603+-	.871
13	KNECT	25.857+-	4.758	26.045+-	5.226
16	SSFF1	.238+-	.046	.240+-	.050
22	2NCD3	1.030+-	.106	1.038+-	.135
28	DUSTD	70.929+-	5.083	71.446+-	7.676
	TOTAL:	105.013+-	4.745	105.779+-	9.722

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			99.27660+-	7.94605	100.00000+-	11.31929	105.01350+-	4.74506	1.06+-	.10	TOTAL
13	AL		*	5.31340+-	.53988	5.35212+-	.69227	6.61694+-	.42433	1.25+-	.15	AL
14	SI		*	26.45080+-	2.37628	26.64354+-	3.20578	24.12906+-	1.59422	.91+-	.10	SI
15	P			<	.06300	<	.06518	.02072+-	.01551	.33+-	.42	P
16	S		*	2.35530+-	.19248	2.37246+-	.27139	2.32445+-	.08762	.99+-	.09	S
17	CL			.05620+-	.01404	.05661+-	.01485	.05103+-	.00895	.91+-	.28	CL
19	K		*	2.29720+-	.20761	2.31394+-	.27935	2.65678+-	.20479	1.16+-	.14	K
20	CA		*	4.50700+-	.45165	4.53984+-	.58224	4.82476+-	.31531	1.07+-	.13	CA
22	TI		*	.70420+-	.13349	.70933+-	.14596	.71917+-	.05722	1.02+-	.21	TI
23	V			.02990+-	.02814	.03012+-	.02845	.01533+-	.00494	.51+-	.51	V
24	CR			<	.00060	<	.00154	.00753+-	.00120	12.55+-	31.92	CR
25	MN		*	.12320+-	.01235	.12410+-	.01592	.08006+-	.00522	.65+-	.08	MN
26	FE		*	5.19440+-	.50569	5.23225+-	.65943	4.76822+-	.33812	.92+-	.11	FE
28	NI			.00690+-	.00122	.00695+-	.00135	.01079+-	.00624	1.56+-	.95	NI
29	CU			2.05870+-	.17525	2.07370+-	.24230	.75534+-	.04986	.37+-	.04	CU
30	ZN		*	.11970+-	.01273	.12057+-	.01605	.12346+-	.00929	1.03+-	.13	ZN
31	GA			.00250+-	.00117	.00252+-	.00119	.00116+-	.00105	.47+-	.47	GA
33	AS		*	.12790+-	.01926	.12883+-	.02197	.10829+-	.01625	.85+-	.18	AS
34	SE			.01450+-	.00184	.01461+-	.00219	.00036+-	.00174	.02+-	.12	SE
35	BR		*	.00560+-	.00247	.00564+-	.00253	.00202+-	.00852	.36+-	1.53	BR
37	RB			.01040+-	.00143	.01048+-	.00167	.01408+-	.00113	1.35+-	.22	RB
38	SR			.02530+-	.00291	.02548+-	.00357	.02258+-	.00147	.89+-	.12	SR
39	Y			<	.00020	<	.00157	.00641+-	.00121	32.07+-	250.58	Y
40	ZR			<	.00000	<	.00520	.00219+-	.00339	.00+-	.00	ZR
42	MO			.04260+-	.00527	.04291+-	.00632	.01695+-	.00230	.40+-	.07	MO
46	PD			<	.00000	<	.00328	.00029+-	.00198	.00+-	.00	PD
47	AG			<	.00000	<	.00421	.00063+-	.00251	.00+-	.00	AG
48	CD			.01180+-	.00580	.01189+-	.00592	.01183+-	.00362	1.00+-	.58	CD
49	IN			<	.00000	<	.00670	.00152+-	.00421	.00+-	.00	IN
50	SN			<	.00000	<	.00819	.00574+-	.00487	.00+-	.00	SN
51	SB			<	.00000	<	.01771	.01961+-	.01086	.00+-	.00	SB
56	BA			<	.00000	<	.03256	.00122+-	.02049	.00+-	.00	BA
57	LA			<	.00000	<	.05843	.02239+-	.03702	.00+-	.00	LA
80	HG			.00080+-	.00071	.00081+-	.00072	.00017+-	.00079	.21+-	1.01	HG
82	PB		*	.29520+-	.02943	.29735+-	.03801	.30267+-	.02669	1.03+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 23.7+- 2.4 COARSE: 75.6+- 7.6 TOTAL: 99.3+- 7.9

RESULTS FOR CMB SITE: GR 603 602 YEAR: 86 DATE: 1201
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9742
CHI SQUARE: 1.9228
DF: 7

#	TYPE	UG/M3		%	
5	5095	3.893+-	.595	13.918+-	2.548
13	KNECT	1.462+-	.557	5.229+-	2.061
16	SSFF1	.120+-	.078	.429+-	.281
22	2NCD3	.804+-	.174	2.875+-	.687
28	DUSTO	20.996+-	1.481	75.073+-	9.240
	TOTAL:	27.275+-	1.388	97.524+-	11.019

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			27.96710+-	2.82100	100.00000+-	14.26496	27.27468+-	1.38845	.98+-	.11	TOTAL
13	AL	*		1.46230+-	.18740	5.22864+-	.85273	2.21525+-	.21143	1.51+-	.24	AL
14	SI	*		9.26310+-	1.03410	33.12142+-	4.98333	8.11414+-	.78293	.88+-	.13	SI
15	P			<	.01250	<	.05097	.00937+-	.00833	.75+-	1.08	P
16	S	*		1.16410+-	.13340	4.16239+-	.63545	1.16410+-	.04884	1.00+-	.12	S
17	CL			.02310+-	.00630	.08260+-	.02402	.00273+-	.00479	.12+-	.21	CL
19	K	*		.74390+-	.08350	2.65991+-	.40141	.65585+-	.06422	.88+-	.13	K
20	CA	*		.48760+-	.05480	1.74348+-	.26329	.48413+-	.03514	.99+-	.13	CA
22	TI	*		.15650+-	.01770	.55959+-	.08480	.13169+-	.01281	.84+-	.13	TI
23	V			.00730+-	.00200	.02610+-	.00762	.00216+-	.00174	.30+-	.25	V
24	CR			.00160+-	.00060	.00572+-	.00222	.00097+-	.00058	.61+-	.43	CR
25	MN	*		.02330+-	.00270	.08331+-	.01280	.01882+-	.00175	.81+-	.12	MN
26	FE	*		.98910+-	.11070	3.53666+-	.53286	1.09008+-	.10443	1.10+-	.16	FE
28	NI			.00430+-	.00070	.01538+-	.00294	.00280+-	.00231	.65+-	.55	NI
29	CU			.38870+-	.04350	1.38985+-	.20940	.16188+-	.01466	.42+-	.06	CU
30	ZN	*		.09210+-	.01060	.32932+-	.05040	.09333+-	.00644	1.01+-	.14	ZN
31	GA			.00090+-	.00090	.00322+-	.00323	.00034+-	.00073	.38+-	.90	GA
33	AS	*		.08910+-	.01630	.31859+-	.06656	.08302+-	.01187	.93+-	.22	AS
34	SE			.00860+-	.00110	.03075+-	.00501	.00005+-	.00129	.01+-	.15	SE
35	BR	*		.00580+-	.00220	.02074+-	.00814	.00005+-	.00503	.01+-	.87	BR
37	RB			.00220+-	.00060	.00787+-	.00229	.00229+-	.00045	1.04+-	.35	RB
38	SR			.00340+-	.00070	.01216+-	.00279	.00398+-	.00057	1.17+-	.29	SR
39	Y			<	.00000	<	.00358	.00250+-	.00090	.00+-	.00	Y
40	ZR			<	.00000	<	.01037	.00024+-	.00287	.00+-	.00	ZR
42	MO			.01230+-	.00240	.04398+-	.00966	.00070+-	.00162	.06+-	.13	MO
46	PD			<	.00000	<	.00679	.00019+-	.00173	.00+-	.00	PD
47	AG			<	.00000	<	.00822	.00048+-	.00196	.00+-	.00	AG
48	CD			<	.00000	<	.01180	.00971+-	.00298	.00+-	.00	CD
49	IN			<	.00000	<	.01359	.00041+-	.00366	.00+-	.00	IN
50	SN			<	.00000	<	.01681	.00349+-	.00433	.00+-	.00	SN
51	SB			<	.00000	<	.03647	.01092+-	.00907	.00+-	.00	SB
56	BA			<	.00000	<	.06758	.00078+-	.01701	.00+-	.00	BA
57	LA			<	.00000	<	.12479	.00373+-	.03359	.00+-	.00	LA
80	HG			.00110+-	.00050	.00393+-	.00183	.00003+-	.00046	.03+-	.42	HG
82	PB	*		.23040+-	.02590	.82383+-	.12443	.23302+-	.02068	1.01+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 28.0+- 2.8 COARSE: 132.2+-13.2 TOTAL: 160.2+-13.5

RESULTS FOR CMB SITE: GP 602 602 YEAR 86 DATE: 120[illegible]
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9449
CHI SQUARE: 2.5289
DF: 9

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
13	KNECT	13.043+-	3.539	9.863+-	2.852
16	SSFF1	.224+-	.049	.169+-	.041
22	2NCD3	.000+-	.000	.000+-	.000
28	DUSTO	118.902+-	8.179	89.915+-	10.902
	TOTAL:	132.169+-	7.302	99.947+-	11.405

COARSE SUSPENDED PARTICULATE

SPECIES		INCL	MISS FLG	MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			132.23820+-	13.20310	100.00000+-	14.11998	132.16870+-	7.30154	1.00+-	.11	TOTAL
13	AL	*		6.39690+-	.79220	4.83741+-	.76952	8.67853+-	.80513	1.36+-	.21	AL
14	SI	*		31.33870+-	3.51870	23.69867+-	3.56075	32.72072+-	3.07429	1.04+-	.15	SI
15	P			<	.02280	<	.02856	.00719+-	.02909	.32+-	1.38	P
16	S	*		1.47480+-	.16950	1.11526+-	.16979	1.09616+-	.10229	.74+-	.11	S
17	CL			<	.00000	<	.00968	.02588+-	.01281	.00+-	.00	CL
19	K	*		3.60830+-	.40490	2.72864+-	.40985	4.31465+-	.42058	1.20+-	.18	K
20	CA	*		3.09360+-	.34710	2.33941+-	.35136	3.20319+-	.22667	1.04+-	.14	CA
22	TI	*		1.12120+-	.25340	.84786+-	.20949	1.22223+-	.11883	1.09+-	.27	TI
23	V			<	.03430	<	.02674	.02050+-	.01000	.60+-	.68	V
24	CR			<	.00000	<	.00181	.00830+-	.00227	.00+-	.00	CR
25	MN	*		.18860+-	.02120	.14262+-	.02144	.11042+-	.01004	.59+-	.08	MN
26	FE	*		7.64630+-	.85680	5.78222+-	.86781	7.22564+-	.68180	.94+-	.14	FE
28	NI			.00740+-	.00150	.00560+-	.00126	.01429+-	.01272	1.93+-	1.76	NI
29	CU			1.59570+-	.17920	1.20669+-	.18133	1.07811+-	.09834	.68+-	.10	CU
30	ZN	*		.06900+-	.01130	.05218+-	.01001	.06127+-	.00730	.89+-	.18	ZN
31	GA			<	.00000	<	.00053	.00039+-	.00083	.00+-	.00	GA
33	AS	*		.01900+-	.00610	.01437+-	.00483	.02770+-	.00613	1.46+-	.57	AS
34	SE			<	.00000	<	.00038	.00016+-	.00070	.00+-	.00	SE
35	BR	*		<	.00000	<	.00053	.00327+-	.00619	.00+-	.00	BR
37	RB			.01950+-	.00250	.01475+-	.00240	.02370+-	.00226	1.22+-	.19	RB
38	SR			.02860+-	.00340	.02163+-	.00336	.02893+-	.00253	1.01+-	.15	SR
39	Y			<	.00000	<	.00098	.00644+-	.00146	.00+-	.00	Y
40	ZR			<	.00000	<	.00348	.00102+-	.00538	.00+-	.00	ZR
42	MO			.04300+-	.00620	.03252+-	.00570	.03405+-	.00406	.79+-	.15	MO
46	PD			<	.00000	<	.00189	.00000+-	.00311	.00+-	.00	PD
47	AG			<	.00000	<	.00250	.00000+-	.00418	.00+-	.00	AG
48	CD			<	.00000	<	.00340	.00257+-	.00545	.00+-	.00	CD
49	IN			<	.00000	<	.00386	.00061+-	.00668	.00+-	.00	IN
50	SN			<	.00000	<	.00469	.00146+-	.00753	.00+-	.00	SN
51	SB			<	.00000	<	.01059	.00524+-	.01733	.00+-	.00	SB
56	BA			<	.00000	<	.01966	.00000+-	.03320	.00+-	.00	BA
57	LA			.08490+-	.04530	.06420+-	.03485	.00914+-	.05684	.11+-	.67	LA
80	HG			<	.00000	<	.00038	.00007+-	.00090	.00+-	.00	HG
82	PB	*		.04370+-	.00700	.03305+-	.00624	.03834+-	.00489	.88+-	.18	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 28.0+- 2.8 COARSE: 132.2+-13.2 TOTAL: 160.2+-13.5

RESULTS FOR CMB SITE: GR 603 602 YEAR: 86 DATE: 1201
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9449
CHI SQUARE: 2.5289
DF: 9

#	TYPE	UG/M3		%	
5	5095	3.893+-	.595	2.430+-	.424
13	KNECT	14.505+-	3.583	9.054+-	2.363
16	SSFF1	.344+-	.092	.215+-	.060
22	2NCD3	.804+-	.174	.502+-	.117
28	DUSTO	139.897+-	8.312	87.324+-	9.004
	TOTAL:	159.443+-	7.432	99.524+-	9.585

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			160.20530+-	13.50111	100.00000+-	11.91811	159.44330+-	7.43238	1.00+-	.10	TOTAL
13	AL	*		7.85920+-	.81406	4.90570+-	.65507	10.89378+-	.83243	1.39+-	.18	AL
14	SI	*		40.60180+-	3.66751	25.34361+-	3.13087	40.83486+-	3.17242	1.01+-	.12	SI
15	P			<	.03530	<	.02521	.01656+-	.03026	.47+-	1.01	P
16	S	*		2.63890+-	.21570	1.64720+-	.19338	2.26026+-	.11335	.86+-	.08	S
17	CL			.02310+-	.01427	.01442+-	.00899	.02861+-	.01368	1.24+-	.97	CL
19	K	*		4.35220+-	.41342	2.71664+-	.34497	4.97050+-	.42545	1.14+-	.15	K
20	CA	*		3.58120+-	.35140	2.23538+-	.28914	3.68732+-	.22938	1.03+-	.12	CA
22	TI	*		1.27770+-	.25402	.79754+-	.17221	1.35392+-	.11952	1.06+-	.23	TI
23	V			.04160+-	.03526	.02597+-	.02212	.02266+-	.01015	.54+-	.52	V
24	CR			<	.00160	<	.00155	.00927+-	.00234	5.80+-	9.08	CR
25	MN	*		.21190+-	.02137	.13227+-	.01738	.12924+-	.01019	.61+-	.08	MN
26	FE	*		8.63540+-	.86392	5.39021+-	.70509	8.31573+-	.68975	.96+-	.13	FE
28	NI			.01170+-	.00166	.00730+-	.00120	.01709+-	.01293	1.46+-	1.12	NI
29	CU			1.98440+-	.18440	1.23866+-	.15539	1.23999+-	.09943	.62+-	.08	CU
30	ZN	*		.16110+-	.01549	.10056+-	.01286	.15459+-	.00973	.96+-	.11	ZN
31	GA			<	.00090	<	.00071	.00073+-	.00111	.82+-	1.61	GA
33	AS	*		.10810+-	.01740	.06748+-	.01226	.11072+-	.01336	1.02+-	.21	AS
34	SE			.00860+-	.00121	.00537+-	.00088	.00020+-	.00147	.02+-	.17	SE
35	BR	*		.00580+-	.00231	.00362+-	.00147	.00332+-	.00797	.57+-	1.39	BR
37	RB			.02170+-	.00257	.01355+-	.00197	.02599+-	.00231	1.20+-	.18	RB
38	SR			.03200+-	.00347	.01997+-	.00274	.03291+-	.00260	1.03+-	.14	SR
39	Y			<	.00000	<	.00102	.00893+-	.00171	.00+-	.00	Y
40	ZR			<	.00000	<	.00339	.00126+-	.00610	.00+-	.00	ZR
42	MO			.05530+-	.00665	.03452+-	.00507	.03475+-	.00437	.63+-	.11	MO
46	PD			<	.00000	<	.00196	.00019+-	.00355	.00+-	.00	PD
47	AG			<	.00000	<	.00251	.00048+-	.00462	.00+-	.00	AG
48	CD			<	.00000	<	.00348	.01228+-	.00621	.00+-	.00	CD
49	IN			<	.00000	<	.00397	.00102+-	.00762	.00+-	.00	IN
50	SN			<	.00000	<	.00486	.00495+-	.00868	.00+-	.00	SN
51	SB			<	.00000	<	.01081	.01616+-	.01956	.00+-	.00	SB
56	BA			<	.00000	<	.02006	.00078+-	.03730	.00+-	.00	BA
57	LA			.08490+-	.05718	.05299+-	.03597	.01287+-	.06602	.15+-	.78	LA
80	HG			.00110+-	.00071	.00069+-	.00045	.00010+-	.00101	.09+-	.92	HG
82	PB		*	.27410+-	.02683	.17109+-	.02210	.27136+-	.02125	.99+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 28.0+- 2.8 COARSE: 132.2+-13.2 TOTAL: 160.2+-13.5

RESULTS FOR CMB SITE: MD 605 [illegible] YEAR: 86 DATE: [illegible]
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9428
CHI SQUARE: 3.9090
DF: 7

#	TYPE	UG/M3		%	
5	5095	7.045+-	.969	22.013+-	3.756
13	KNECT	4.875+-	1.040	15.231+-	3.593
21	2NCD2	.190+-	.024	.594+-	.096
28	DUSTO	21.666+-	1.744	67.695+-	8.737
	TOTAL:	33.776+-	1.787	105.532+-	12.021

	SPECIES	INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			32.00500+-	3.22860	100.00000+-	14.26630	33.77560+-	1.78659	1.06+-	.12	TOTAL
13	AL	*		1.89160+-	.23310	5.91033+-	.94124	2.52433+-	.22063	1.33+-	.20	AL
14	SI	*		8.83720+-	.98860	27.61193+-	4.15932	9.04192+-	.81312	1.02+-	.15	SI
15	P			<	.00680	<	.04848	.01278+-	.00835	1.88+-	4.45	P
16	S	*		1.95170+-	.21990	6.09811+-	.92223	1.95170+-	.07423	1.00+-	.12	S
17	CL			.04020+-	.00730	.12561+-	.02609	.00911+-	.00400	.23+-	.11	CL
19	K	*		.67340+-	.07580	2.10405+-	.31803	.70161+-	.06637	1.04+-	.15	K
20	CA	*		.93450+-	.10490	2.91986+-	.44067	.93549+-	.07008	1.00+-	.14	CA
22	TI	*		.19010+-	.02150	.59397+-	.09002	.14417+-	.01327	.76+-	.11	TI
23	V			.00690+-	.00230	.02156+-	.00751	.00300+-	.00181	.43+-	.30	V
24	CR			.00400+-	.00080	.01250+-	.00280	.00150+-	.00060	.37+-	.17	CR
25	MN			.06080+-	.00690	.18997+-	.02885	.02239+-	.00185	.37+-	.05	MN
26	FE	*		1.41970+-	.15920	4.43587+-	.66908	1.22765+-	.10871	.86+-	.12	FE
28	NI			.00410+-	.00070	.01281+-	.00254	.00277+-	.00238	.68+-	.59	NI
29	CU			.21660+-	.02440	.67677+-	.10234	.18815+-	.01551	.87+-	.12	CU
30	ZN	*		.02980+-	.00370	.09311+-	.01490	.02473+-	.00201	.83+-	.12	ZN
31	GA			<	.00020	<	.00125	.00029+-	.00033	1.46+-	3.35	GA
33	AS	*		.00960+-	.00350	.03000+-	.01135	.01889+-	.00284	1.97+-	.78	AS
34	SE			.00350+-	.00060	.01094+-	.00218	.00016+-	.00028	.04+-	.08	SE
35	BR	*		.00610+-	.00090	.01906+-	.00341	.00016+-	.00137	.03+-	.23	BR
37	RB			.00240+-	.00060	.00750+-	.00202	.00264+-	.00046	1.10+-	.34	RB
38	SR			.00360+-	.00070	.01125+-	.00246	.00504+-	.00060	1.40+-	.32	SR
39	Y			<	.00000	<	.00250	.00230+-	.00066	.00+-	.00	Y
40	ZR			<	.00000	<	.01000	.00045+-	.00302	.00+-	.00	ZR
42	MO			.00220+-	.00220	.00687+-	.00691	.00013+-	.00171	.06+-	.78	MO
46	PD			<	.00000	<	.00656	.00062+-	.00182	.00+-	.00	PD
47	AG			<	.00000	<	.00844	.00023+-	.00208	.00+-	.00	AG
48	CD			<	.00000	<	.01062	.00206+-	.00305	.00+-	.00	CD
49	IN			<	.00000	<	.01312	.00007+-	.00387	.00+-	.00	IN
50	SN			<	.00000	<	.01594	.00068+-	.00458	.00+-	.00	SN
51	SB			<	.00000	<	.03562	.00281+-	.00953	.00+-	.00	SB
56	BA			<	.00000	<	.06530	.00258+-	.01800	.00+-	.00	BA
57	LA			<	.00000	<	.12092	.01243+-	.03546	.00+-	.00	LA
80	HG			<	.00000	<	.00125	.00011+-	.00039	.00+-	.00	HG
82	PB	*		.05550+-	.00650	.17341+-	.02680	.05120+-	.00487	.92+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 32.0+- 3.2 COARSE: 95.0+- 9.5 TOTAL: 127.0+-10.0

RESULTS FOR CMB SITE: MD 609 608 YEAR: 86 DATE: 1204
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9429
CHI SQUARE: 3.2652
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.385+-	.776	1.458+-	.830
13	KNECT	36.923+-	6.072	38.876+-	7.485
21	2NCD2	.000+-	.000	.000+-	.000
23	SLPR#	.038+-	.012	.040+-	.013
28	DUSTO	60.235+-	5.719	63.421+-	8.751
	TOTAL:	98.581+-	5.455	103.795+-	11.875

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			94.97720+-	9.51070	100.00000+-	14.16146	98.58122+-	5.45481	1.04+-	.12	TOTAL
13	AL	*		5.02200+-	.62680	5.28758+-	.84610	5.91516+-	.44662	1.18+-	.17	AL
14	SI	*		22.47490+-	2.53370	23.66347+-	3.56812	21.30480+-	1.65746	.95+-	.13	SI
15	P			<	.00540	<	.02643	.02034+-	.01563	3.77+-	17.75	P
16	S	*		1.02060+-	.12110	1.07457+-	.16684	.99697+-	.06180	.98+-	.13	S
17	CL			<	.00000	<	.01263	.07326+-	.00967	.00+-	.00	CL
19	K	*		1.86150+-	.21030	1.95994+-	.29588	2.44024+-	.21524	1.31+-	.19	K
20	CA	*		5.20970+-	.58520	5.48521+-	.82543	5.78725+-	.47557	1.11+-	.15	CA
22	TI	*		.66460+-	.15200	.69975+-	.17471	.69876+-	.06095	1.05+-	.26	TI
23	V			<	.02420	<	.02645	.01601+-	.00520	.66+-	.72	V
24	CR			<	.00000	<	.00168	.00846+-	.00127	.00+-	.00	CR
25	MN	*		.14540+-	.01650	.15309+-	.02317	.07951+-	.00582	.55+-	.07	MN
26	FE	*		5.24810+-	.59100	5.52564+-	.83268	4.59643+-	.36340	.88+-	.12	FE
28	NI			.00480+-	.00100	.00505+-	.00117	.00962+-	.00645	2.00+-	1.41	NI
29	CU			.73080+-	.08240	.76945+-	.11603	.73416+-	.05502	1.00+-	.14	CU
30	ZN	*		.04720+-	.00660	.04970+-	.00855	.03318+-	.00315	.70+-	.12	ZN
31	GA			<	.00000	<	.00053	.00111+-	.00041	.00+-	.00	GA
33	AS	*		.00590+-	.00280	.00621+-	.00301	.00885+-	.00133	1.50+-	.75	AS
34	SE			<	.00000	<	.00042	.00044+-	.00027	.00+-	.00	SE
35	BR	*		<	.00000	<	.00053	.00236+-	.00163	.00+-	.00	BR
37	RB			.01000+-	.00140	.01053+-	.00181	.01404+-	.00117	1.40+-	.23	RB
38	SR			.03030+-	.00370	.03190+-	.00504	.02469+-	.00176	.81+-	.12	SR
39	Y			<	.00000	<	.00105	.00523+-	.00080	.00+-	.00	Y
40	ZR			<	.00000	<	.00453	.00288+-	.00307	.00+-	.00	ZR
42	MO			.02560+-	.00400	.02695+-	.00500	.01696+-	.00222	.66+-	.13	MO
46	PD			<	.00000	<	.00232	.00000+-	.00178	.00+-	.00	PD
47	AG			<	.00000	<	.00295	.00001+-	.00236	.00+-	.00	AG
48	CD			<	.00000	<	.00411	.00060+-	.00305	.00+-	.00	CD
49	IN			<	.00000	<	.00474	.00176+-	.00374	.00+-	.00	IN
50	SN			<	.00000	<	.00569	.00279+-	.00429	.00+-	.00	SN
51	SB			<	.00000	<	.01211	.00891+-	.00986	.00+-	.00	SB
56	BA			<	.00000	<	.02380	.00000+-	.01884	.00+-	.00	BA
57	LA			<	.00000	<	.04159	.02588+-	.03229	.00+-	.00	LA
80	HG			<	.00000	<	.00053	.00018+-	.00039	.00+-	.00	HG
82	PB	*		.02100+-	.00350	.02211+-	.00430	.02156+-	.00170	1.03+-	.19	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 32.0+- 3.2 COARSE: 95.0+- 9.5 TOTAL: 127.0+-10.0

RESULTS FOR CME SITE: HC 609 6CE YEAR: 86 DATE: 12JA
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9429
CHI SQUARE: 3.2652
DF: 8

#	TYPE	UG/M3		%	
5	5095	7.045+-	.969	5.548+-	.881
7	GYPSU	1.385+-	.776	1.091+-	.617
13	KNECT	41.798+-	6.160	32.916+-	5.506
21	2NCD2	.190+-	.024	.150+-	.022
23	SLPR#	.038+-	.012	.030+-	.010
28	DUSTO	81.901+-	5.979	64.498+-	6.942
	TOTAL:	132.357+-	5.740	104.233+-	9.402

	SPECIES	INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			126.98220+-	10.04377	100.00000+-	11.18585	132.35680+-	5.73993	1.04+-	.09	TOTAL
13	AL	*		6.91360+-	.66874	5.44454+-	.68030	8.43948+-	.49815	1.22+-	.14	AL
14	SI	*		31.31210+-	2.71974	24.65865+-	2.89680	30.34672+-	1.84617	.97+-	.10	SI
15	P			<	.01220	<	.02324	.03312+-	.01772	2.71+-	6.72	P
16	S	*		2.97230+-	.25104	2.34072+-	.27085	2.94867+-	.09658	.99+-	.09	S
17	CL			.04020+-	.01405	.03166+-	.01134	.08237+-	.01046	2.05+-	.76	CL
19	K	*		2.53490+-	.22354	1.99626+-	.23648	3.14185+-	.22524	1.24+-	.14	K
20	CA	*		6.14420+-	.59453	4.83863+-	.60471	6.72275+-	.48071	1.09+-	.13	CA
22	TI	*		.85470+-	.15351	.67309+-	.13210	.84293+-	.06238	.99+-	.19	TI
23	V			.03110+-	.02511	.02449+-	.01987	.01901+-	.00551	.61+-	.52	V
24	CR			.00400+-	.00179	.00315+-	.00143	.00996+-	.00140	2.49+-	1.17	CR
25	MN	*		.20620+-	.01788	.16238+-	.01906	.10190+-	.00611	.49+-	.05	MN
26	FE	*		6.66780+-	.61207	5.25097+-	.63626	5.82408+-	.37931	.87+-	.10	FE
28	NI			.00890+-	.00122	.00701+-	.00111	.01239+-	.00688	1.39+-	.80	NI
29	CU			.94740+-	.08594	.74609+-	.08979	.92231+-	.05716	.97+-	.11	CU
30	ZN	*		.07700+-	.00757	.06064+-	.00765	.05792+-	.00373	.75+-	.09	ZN
31	GA			<	.00020	<	.00050	.00140+-	.00052	7.00+-	22.56	GA
33	AS	*		.01550+-	.00448	.01221+-	.00366	.02774+-	.00314	1.79+-	.56	AS
34	SE			.00350+-	.00072	.00276+-	.00061	.00060+-	.00039	.17+-	.12	SE
35	BR	*		.00610+-	.00103	.00480+-	.00090	.00252+-	.00213	.41+-	.36	BR
37	RB			.01240+-	.00152	.00977+-	.00143	.01668+-	.00126	1.35+-	.19	RB
38	SR			.03390+-	.00377	.02670+-	.00364	.02974+-	.00186	.88+-	.11	SR
39	Y			<	.00000	<	.00101	.00753+-	.00103	.00+-	.00	Y
40	ZR			<	.00000	<	.00422	.00333+-	.00431	.00+-	.00	ZR
42	MO			.02780+-	.00457	.02189+-	.00399	.01709+-	.00280	.61+-	.14	MO
46	PD			<	.00000	<	.00240	.00062+-	.00255	.00+-	.00	PD
47	AG			<	.00000	<	.00306	.00024+-	.00315	.00+-	.00	AG
48	CD			<	.00000	<	.00407	.00266+-	.00431	.00+-	.00	CD
49	IN			<	.00000	<	.00485	.00182+-	.00539	.00+-	.00	IN
50	SN			<	.00000	<	.00585	.00347+-	.00628	.00+-	.00	SN
51	SB			<	.00000	<	.01275	.01172+-	.01371	.00+-	.00	SB
56	BA			<	.00000	<	.02424	.00258+-	.02606	.00+-	.00	BA
57	LA			<	.00000	<	.04355	.03831+-	.04795	.00+-	.00	LA
80	HG			<	.00000	<	.00050	.00030+-	.00055	.00+-	.00	HG
82	PB	*		.07650+-	.00738	.06024+-	.00752	.07276+-	.00516	.95+-	.11	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 32.0+- 3.2 COARSE: 95.0+- 9.5 TOTAL: 127.0+-10.0

RESULTS FOR CMB SITE: GR 605 604 YEAR: 86 DATE: 1204
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9788
CHI SQUARE: 1.5841
DF: 6

#	TYPE	UG/M3		%	
5	5095	6.616+-	.912	23.835+-	4.075
10	TRANS	.988+-	.275	3.559+-	1.053
13	KNECT	2.664+-	.689	9.596+-	2.664
16	SSFF1	.058+-	.012	.209+-	.049
28	DUSTO	18.741+-	1.463	67.511+-	8.627
	TOTAL:	29.067+-	1.563	104.710+-	11.998

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			27.75950+-	2.80860	100.00000+-	14.30847	29.06690+-	1.56324	1.05+-	.12	TOTAL
13	AL		*	1.56620+-	.19420	5.64203+-	.90292	2.07923+-	.18944	1.33+-	.20	AL
14	SI		*	6.92680+-	.78640	24.95290+-	3.79462	7.51666+-	.70034	1.09+-	.16	SI
15	P			<	.00580	<	.04940	.01039+-	.00731	1.79+-	4.41	P
16	S		*	1.83540+-	.20690	6.61179+-	1.00151	1.83540+-	.06929	1.00+-	.12	S
17	CL			.02710+-	.00590	.09762+-	.02344	.01971+-	.00502	.73+-	.24	CL
19	K		*	.58390+-	.06580	2.10342+-	.31855	.59519+-	.05735	1.02+-	.15	K
20	CA		*	.62250+-	.07000	2.24248+-	.33921	.61584+-	.04342	.99+-	.13	CA
22	TI		*	.15420+-	.01750	.55549+-	.08446	.12098+-	.01145	.78+-	.12	TI
23	V			.00710+-	.00200	.02558+-	.00766	.00227+-	.00156	.32+-	.24	V
24	CR			.00390+-	.00070	.01405+-	.00289	.00107+-	.00051	.27+-	.14	CR
25	MN			.07560+-	.00860	.27234+-	.04146	.01817+-	.00157	.24+-	.03	MN
26	FE		*	1.31430+-	.14740	4.73460+-	.71513	1.02118+-	.09352	.78+-	.11	FE
28	NI			.00500+-	.00070	.01801+-	.00311	.00235+-	.00206	.47+-	.42	NI
29	CU			.15790+-	.01780	.56881+-	.08616	.15130+-	.01320	.96+-	.14	CU
30	ZN		*	.02570+-	.00310	.09258+-	.01458	.02579+-	.00220	1.00+-	.15	ZN
31	GA			.00070+-	.00030	.00252+-	.00111	.00011+-	.00025	.16+-	.37	GA
33	AS		*	.01070+-	.00280	.03855+-	.01081	.01112+-	.00116	1.04+-	.29	AS
34	SE			.00280+-	.00040	.01009+-	.00177	.00010+-	.00020	.03+-	.07	SE
35	BR		*	.00500+-	.00080	.01801+-	.00341	.00580+-	.00210	1.16+-	.46	BR
37	RB			.00180+-	.00050	.00648+-	.00192	.00215+-	.00040	1.20+-	.40	RB
38	SR			.00200+-	.00060	.00720+-	.00228	.00399+-	.00051	2.00+-	.65	SR
39	Y			<	.00000	<	.00216	.00178+-	.00055	.00+-	.00	Y
40	ZR			<	.00000	<	.00973	.00023+-	.00257	.00+-	.00	ZR
42	MO			.00180+-	.00180	.00648+-	.00652	.00021+-	.00146	.12+-	.82	MO
46	PD			<	.00000	<	.00648	.00034+-	.00155	.00+-	.00	PD
47	AG			<	.00000	<	.00829	.00006+-	.00177	.00+-	.00	AG
48	CD			<	.00000	<	.01081	.00154+-	.00260	.00+-	.00	CD
49	IN			<	.00000	<	.01333	.00004+-	.00330	.00+-	.00	IN
50	SN			<	.00000	<	.01585	.00036+-	.00389	.00+-	.00	SN
51	SB			<	.00000	<	.03458	.00091+-	.00812	.00+-	.00	SB
56	BA			<	.00000	<	.06520	.00219+-	.01532	.00+-	.00	BA
57	LA			<	.00000	<	.11528	.00679+-	.03022	.00+-	.00	LA
80	HG			.00050+-	.00030	.00180+-	.00110	.00006+-	.00033	.12+-	.66	HG
82	PB		*	.04090+-	.00490	.14734+-	.02310	.03828+-	.00658	.94+-	.20	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 27.8+- 2.8 COARSE: 119.7+-12.0 TOTAL: 147.5+-12.3

RESULTS FOR CME SITE GF 605 604 YEAR: 86 DATE: 1204
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .8999
CHI SQUARE: 4.0723
DF: 10

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
10	TRANS	.000+-	.000	.000+-	.000
13	KNECT	18.145+-	3.982	15.155+-	3.656
16	SSFF1	.000+-	.000	.000+-	.000
28	DUSTO	107.260+-	7.545	89.586+-	10.964
	TOTAL:	125.405+-	6.683	104.741+-	11.882

SPECIES	INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL		119.72820+-	11.98980	100.00000+-	14.16219	125.40480+-	6.68318	1.05+-	.12	TOTAL
13	AL	*	6.19990+-	.76530	5.17831+-	.82309	8.14836+-	.72958	1.31+-	.20	AL
14	SI	*	27.88080+-	3.13480	23.28675+-	3.50620	30.50482+-	2.78166	1.09+-	.16	SI
15	P		<	.02140	<	.02787	.01000+-	.02630	.47+-	1.43	P
16	S	*	1.21960+-	.14280	1.01864+-	.15694	1.02757+-	.09237	.84+-	.12	S
17	CL		<	.00000	<	.00935	.03600+-	.01182	.00+-	.00	CL
19	K	*	2.84270+-	.31980	2.37429+-	.35760	3.94510+-	.37958	1.39+-	.21	K
20	CA	*	3.52740+-	.39660	2.94617+-	.44359	3.69791+-	.26914	1.05+-	.14	CA
22	TI	*	1.14770+-	.25940	.95859+-	.23697	1.11912+-	.10726	.98+-	.24	TI
23	V		<	.03120	<	.02694	.01913+-	.00903	.61+-	.69	V
24	CR		<	.00000	<	.00192	.00812+-	.00206	.00+-	.00	CR
25	MN	*	.22130+-	.02500	.18484+-	.02790	.10454+-	.00912	.47+-	.07	MN
26	FE	*	7.84710+-	.88200	6.55409+-	.98664	6.70346+-	.61654	.85+-	.12	FE
28	NI		.00560+-	.00130	.00468+-	.00118	.01304+-	.01148	2.33+-	2.12	NI
29	CU		1.03180+-	.11600	.86179+-	.12975	1.00082+-	.08915	.97+-	.14	CU
30	ZN	*	.06470+-	.00900	.05404+-	.00926	.03389+-	.00487	.52+-	.10	ZN
31	GA		<	.00000	<	.00042	.00054+-	.00065	.00+-	.00	GA
33	AS	*	.00550+-	.00220	.00459+-	.00189	.00229+-	.00164	.42+-	.34	AS
34	SE		<	.00000	<	.00033	.00022+-	.00043	.00+-	.00	SE
35	BR	*	<	.00000	<	.00033	.00310+-	.00268	.00+-	.00	BR
37	RB		.01250+-	.00190	.01044+-	.00190	.02181+-	.00204	1.74+-	.31	RB
38	SR		.02570+-	.00310	.02147+-	.00337	.02821+-	.00233	1.10+-	.16	SR
39	Y		<	.00000	<	.00084	.00622+-	.00130	.00+-	.00	Y
40	ZR		<	.00000	<	.00334	.00142+-	.00488	.00+-	.00	ZR
42	MO		.03590+-	.00480	.02998+-	.00501	.02993+-	.00367	.83+-	.15	MO
46	PD		<	.00000	<	.00159	.00000+-	.00282	.00+-	.00	PD
47	AG		<	.00000	<	.00200	.00000+-	.00379	.00+-	.00	AG
48	CD		<	.00000	<	.00276	.00000+-	.00488	.00+-	.00	CD
49	IN		<	.00000	<	.00334	.00085+-	.00606	.00+-	.00	IN
50	SN		<	.00000	<	.00393	.00123+-	.00683	.00+-	.00	SN
51	SB		<	.00000	<	.00844	.00410+-	.01571	.00+-	.00	SB
56	BA		<	.00000	<	.01654	.00000+-	.03012	.00+-	.00	BA
57	LA		<	.00000	<	.02848	.01272+-	.05157	.00+-	.00	LA
80	HG		<	.00000	<	.00042	.00009+-	.00065	.00+-	.00	HG
82	PB	*	.01250+-	.00260	.01044+-	.00241	.01288+-	.00219	1.03+-	.28	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 27.8+- 2.8 COARSE: 119.7+-12.0 TOTAL: 147.5+-12.3

RESULTS FOR CMB SITE: GR 605 604 YEAR: 86 DATE: 1204
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .8999
CHI SQUARE: 4.0723
DF: 10

#	TYPE	UG/M3		%	
5	5095	6.616+-	.912	4.486+-	.723
10	TRANS	.988+-	.275	.670+-	.194
13	KNECT	20.808+-	4.041	14.109+-	2.982
16	SSFF1	.058+-	.012	.039+-	.009
28	DUSTO	126.001+-	7.686	85.431+-	8.834
	TOTAL:	154.472+-	6.864	104.735+-	9.906

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			147.48770+-	12.31436	100.00000+-	11.80786	154.47170+-	6.86357	1.05+-	.10	TOTAL
13	AL	*		7.76610+-	.78956	5.26559+-	.69273	10.22758+-	.75378	1.32+-	.17	AL
14	SI	*		34.80760+-	3.23193	23.60034+-	2.94699	38.02148+-	2.86847	1.09+-	.13	SI
15	P			<	.02720	<	.02446	.02039+-	.02730	.75+-	1.41	P
16	S	*		3.05500+-	.25139	2.07136+-	.24283	2.86297+-	.11547	.94+-	.09	S
17	CL			.02710+-	.01266	.01837+-	.00872	.05571+-	.01284	2.06+-	1.07	CL
19	K	*		3.42660+-	.32650	2.32331+-	.29434	4.54028+-	.38389	1.33+-	.17	K
20	CA	*		4.14990+-	.40273	2.81373+-	.36021	4.31376+-	.27262	1.04+-	.12	CA
22	TI	*		1.30190+-	.25999	.88272+-	.19107	1.24010+-	.10787	.95+-	.21	TI
23	V			.03830+-	.03216	.02597+-	.02191	.02140+-	.00916	.56+-	.53	V
24	CR			.00390+-	.00240	.00264+-	.00164	.00919+-	.00212	2.36+-	1.55	CR
25	MN	*		.29690+-	.02644	.20130+-	.02457	.12270+-	.00926	.41+-	.05	MN
26	FE	*		9.16140+-	.89423	6.21164+-	.79787	7.72464+-	.62360	.84+-	.11	FE
28	NI			.01060+-	.00148	.00719+-	.00117	.01539+-	.01166	1.45+-	1.12	NI
29	CU			1.18970+-	.11736	.80664+-	.10425	1.15212+-	.09012	.97+-	.12	CU
30	ZN	*		.09040+-	.00952	.06129+-	.00824	.05968+-	.00534	.66+-	.09	ZN
31	GA			.00070+-	.00058	.00047+-	.00040	.00065+-	.00070	.93+-	1.26	GA
33	AS	*		.01620+-	.00356	.01098+-	.00258	.01341+-	.00201	.83+-	.22	AS
34	SE			.00280+-	.00057	.00190+-	.00042	.00031+-	.00048	.11+-	.17	SE
35	BR	*		.00500+-	.00089	.00339+-	.00067	.00890+-	.00341	1.78+-	.75	BR
37	RB			.01430+-	.00196	.00970+-	.00156	.02396+-	.00208	1.68+-	.27	RB
38	SR			.02770+-	.00316	.01878+-	.00265	.03220+-	.00239	1.16+-	.16	SR
39	Y			<	.00000	<	.00079	.00801+-	.00141	.00+-	.00	Y
40	ZR			<	.00000	<	.00327	.00164+-	.00552	.00+-	.00	ZR
42	MO			.03770+-	.00513	.02556+-	.00408	.03014+-	.00395	.80+-	.15	MO
46	PD			<	.00000	<	.00177	.00034+-	.00322	.00+-	.00	PD
47	AG			<	.00000	<	.00225	.00006+-	.00418	.00+-	.00	AG
48	CD			<	.00000	<	.00302	.00154+-	.00552	.00+-	.00	CD
49	IN			<	.00000	<	.00369	.00090+-	.00690	.00+-	.00	IN
50	SN			<	.00000	<	.00437	.00159+-	.00786	.00+-	.00	SN
51	SB			<	.00000	<	.00945	.00501+-	.01769	.00+-	.00	SB
56	BA			<	.00000	<	.01819	.00219+-	.03379	.00+-	.00	BA
57	LA			<	.00000	<	.03171	.01951+-	.05977	.00+-	.00	LA
80	HG			<	.00050	<	.00040	.00015+-	.00073	.30+-	1.50	HG
82	PB		*	.05340+-	.00555	.03621+-	.00483	.05116+-	.00693	.96+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 27.8+- 2.8 COARSE: 119.7+-12.0 TOTAL: 147.5+-12.3

RESULTS FOR THE SITE [illegible] YEAR 80 DATE: 1205
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9305
CHI SQUARE: 4.0305
DF: 8

#	TYPE	UG/M3		%	
5	5095	3.342+-	.416	34.704+-	5.737
13	KNECT	.245+-	.069	2.546+-	.768
21	2NCD2	.226+-	.022	2.344+-	.345
28	DUSTO	1.792+-	.147	18.606+-	2.540
	TOTAL:	5.605+-	.434	58.201+-	7.780

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			9.63060+-	1.04910	100.00000+-	15.40560	5.60509+-	.43433	.58+-	.08	TOTAL
13	AL	*		.13420+-	.01840	1.39348+-	.24402	.19759+-	.01811	1.47+-	.24	AL
14	SI	*		.76350+-	.08570	7.92785+-	1.24004	.71643+-	.06695	.94+-	.14	SI
15	P			<	.00000	<	.04257	.00091+-	.00074	.00+-	.00	P
16	S	*		.82260+-	.09380	8.54152+-	1.34699	.82260+-	.03391	1.00+-	.12	S
17	CL			<	.00000	<	.03323	.00046+-	.00089	.00+-	.00	CL
19	K	*		.09880+-	.01150	1.02590+-	.16355	.05709+-	.00548	.58+-	.09	K
20	CA	*		.06010+-	.00710	.62405+-	.10028	.05692+-	.00411	.95+-	.13	CA
22	TI	*		.01300+-	.00170	.13499+-	.02297	.01154+-	.00109	.89+-	.14	TI
23	V			<	.00020	<	.00416	.00021+-	.00015	1.06+-	2.25	V
24	CR			<	.00000	<	.00415	.00010+-	.00005	.00+-	.00	CR
25	MN	*		.00070+-	.00050	.00727+-	.00525	.00171+-	.00015	2.45+-	1.76	MN
26	FE	*		.09940+-	.01140	1.03213+-	.16326	.09673+-	.00894	.97+-	.14	FE
28	NI			.00060+-	.00030	.00623+-	.00319	.00022+-	.00020	.36+-	.37	NI
29	CU			.03390+-	.00390	.35200+-	.05577	.01560+-	.00127	.46+-	.06	CU
30	ZN	*		.01920+-	.00230	.19936+-	.03228	.02047+-	.00199	1.07+-	.16	ZN
31	GA			<	.00020	<	.00312	.00012+-	.00019	.60+-	1.29	GA
33	AS	*		.03500+-	.00500	.36342+-	.06529	.02047+-	.00325	.58+-	.12	AS
34	SE			.00720+-	.00090	.07476+-	.01240	.00001+-	.00020	.00+-	.03	SE
35	BR	*		.00360+-	.00080	.03738+-	.00925	.00001+-	.00159	.00+-	.44	BR
37	RB			<	.00010	<	.00519	.00021+-	.00005	2.05+-	10.27	RB
38	SR			<	.00000	<	.00519	.00037+-	.00005	.00+-	.00	SR
39	Y			<	.00000	<	.00727	.00025+-	.00018	.00+-	.00	Y
40	ZR			<	.00000	<	.02907	.00006+-	.00025	.00+-	.00	ZR
42	MO			<	.00000	<	.01973	.00015+-	.00014	.00+-	.00	MO
46	PD			<	.00000	<	.01765	.00003+-	.00015	.00+-	.00	PD
47	AG			<	.00000	<	.02492	.00014+-	.00017	.00+-	.00	AG
48	CD			<	.00000	<	.03115	.00225+-	.00033	.00+-	.00	CD
49	IN			<	.00000	<	.03946	.00008+-	.00032	.00+-	.00	IN
50	SN			<	.00000	<	.04776	.00081+-	.00038	.00+-	.00	SN
51	SB			<	.00000	<	.10591	.00333+-	.00086	.00+-	.00	SB
56	BA			<	.00000	<	.19521	.00013+-	.00146	.00+-	.00	BA
57	LA			<	.00000	<	.36031	.00063+-	.00289	.00+-	.00	LA
80	HG			.00030+-	.00030	.00312+-	.00313	.00001+-	.00011	.02+-	.36	HG
82	PB	*		.04980+-	.00590	.51710+-	.08322	.05642+-	.00562	1.13+-	.18	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.6+- 1.0 COARSE: 13.3+- 1.4 TOTAL: 23.0+- 1.7

RESULTS FOR CMB SITE: MD 619 618 YEAR: 86 DATE: 1209
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9543
CHI SQUARE: 2.4562
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	.689+-	.194	5.174+-	1.551
13	KNECT	4.773+-	.931	35.822+-	7.933
16	SSFF1	.088+-	.015	.658+-	.130
21	2NCD2	.000+-	.000	.000+-	.000
28	DUSTO	8.305+-	.816	62.330+-	8.951
	TOTAL:	13.856+-	.777	103.984+-	12.358

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			13.32500+-	1.39620	100.00000+-	14.81820	13.85592+-	.77716	1.04+-	.12	TOTAL
13	AL	*		.74270+-	.09320	5.57373+-	.91120	.79968+-	.06095	1.08+-	.16	AL
14	SI	*		3.52070+-	.39580	26.42176+-	4.06048	2.89131+-	.22686	.82+-	.11	SI
15	P			<	.02250	<	.17053	.00263+-	.00218	.12+-	.15	P
16	S	*		.24260+-	.03160	1.82064+-	.30435	.22826+-	.01528	.94+-	.14	S
17	CL			.01260+-	.00410	.09456+-	.03233	.00947+-	.00138	.75+-	.27	CL
19	K	*		.25840+-	.02960	1.93921+-	.30105	.33406+-	.02964	1.29+-	.19	K
20	CA	*		.76780+-	.08630	5.76210+-	.88543	.87385+-	.06354	1.14+-	.15	CA
22	TI	*		.08230+-	.01860	.61764+-	.15386	.09560+-	.00839	1.16+-	.28	TI
23	V			.00490+-	.00490	.03677+-	.03697	.00241+-	.00072	.49+-	.51	V
24	CR			<	.00000	<	.00300	.00125+-	.00017	.00+-	.00	CR
25	MN	*		.01790+-	.00210	.13433+-	.02113	.01073+-	.00079	.60+-	.08	MN
26	FE	*		.67420+-	.07590	5.05966+-	.77815	.62944+-	.04981	.93+-	.13	FE
28	NI			.00030+-	.00030	.00225+-	.00226	.00147+-	.00089	4.91+-	5.74	NI
29	CU			.14160+-	.01600	1.06266+-	.16376	.10469+-	.00752	.74+-	.10	CU
30	ZN	*		.01080+-	.00160	.08105+-	.01471	.01299+-	.00198	1.20+-	.26	ZN
31	GA			<	.00000	<	.00225	.00014+-	.00017	.00+-	.00	GA
33	AS	*		.00950+-	.00220	.07129+-	.01812	.01011+-	.00230	1.06+-	.35	AS
34	SE			<	.00000	<	.00225	.00006+-	.00020	.00+-	.00	SE
35	BR	*		<	.00000	<	.00300	.00032+-	.00213	.00+-	.00	BR
37	RB			<	.00000	<	.00300	.00191+-	.00016	.00+-	.00	RB
38	SR			.00400+-	.00070	.03002+-	.00612	.00330+-	.00024	.82+-	.16	SR
39	Y			<	.00000	<	.00450	.00070+-	.00016	.00+-	.00	Y
40	ZR			<	.00000	<	.01876	.00037+-	.00043	.00+-	.00	ZR
42	MO			<	.00000	<	.01201	.00266+-	.00031	.00+-	.00	MO
46	PD			<	.00000	<	.01201	.00000+-	.00024	.00+-	.00	PD
47	AG			<	.00000	<	.01501	.00000+-	.00032	.00+-	.00	AG
48	CD			<	.00000	<	.02026	.00101+-	.00054	.00+-	.00	CD
49	IN			<	.00000	<	.02402	.00022+-	.00051	.00+-	.00	IN
50	SN			<	.00000	<	.03002	.00055+-	.00059	.00+-	.00	SN
51	SB			<	.00000	<	.06379	.00198+-	.00137	.00+-	.00	SB
56	BA			<	.00000	<	.12533	.00000+-	.00257	.00+-	.00	BA
57	LA			<	.00000	<	.22439	.00335+-	.00440	.00+-	.00	LA
80	HG			<	.00000	<	.00225	.00002+-	.00022	.00+-	.00	HG
82	PB	*		.01550+-	.00250	.11632+-	.02237	.01194+-	.00168	.77+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.6+- 1.0 COARSE: 13.3+- 1.4 TOTAL: 23.0+- 1.7

RESULTS FOR CMB SITE: HD 619 618 YEAR: 86 DATE: 1209
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9543
CHI SQUARE: 2.4562
DF: 8

#	TYPE	UG/M3		%	
5	5095	3.342+-	.416	14.560+-	2.123
7	GYPSU	.689+-	.194	3.004+-	.874
13	KNECT	5.019+-	.934	21.862+-	4.395
16	SSFF1	.088+-	.015	.382+-	.070
21	2NCD2	.226+-	.022	.983+-	.123
28	OUSTO	10.097+-	.829	43.986+-	4.923
	TOTAL:	19.461+-	.890	84.777+-	7.526

	SPECIES	INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			22.95560+-	1.74642	100.00000+-	10.75908	19.46101+-	.89029	.85+-	.08	TOTAL
13	AL	*		.87690+-	.09500	3.81998+-	.50569	.99727+-	.06358	1.14+-	.14	AL
14	SI	*		4.28420+-	.40497	18.66298+-	2.26455	3.60775+-	.23653	.84+-	.10	SI
15	P			<	.02250	<	.10034	.00354+-	.00230	.16+-	.19	P
16	S	*		1.06520+-	.09898	4.64026+-	.55726	1.05086+-	.03719	.99+-	.10	S
17	CL			.01260+-	.00520	.05489+-	.02304	.00993+-	.00164	.79+-	.35	CL
19	K	*		.35720+-	.03176	1.55605+-	.18207	.39115+-	.03014	1.10+-	.13	K
20	CA	*		.82790+-	.08659	3.60653+-	.46645	.93077+-	.06367	1.12+-	.14	CA
22	TI	*		.09530+-	.01868	.41515+-	.08728	.10714+-	.00846	1.12+-	.24	TI
23	V			.00510+-	.00492	.02222+-	.02148	.00263+-	.00073	.51+-	.52	V
24	CR			<	.00000	<	.00246	.00135+-	.00018	.00+-	.00	CR
25	MN	*		.01860+-	.00216	.08103+-	.01124	.01244+-	.00081	.67+-	.09	MN
26	FE	*		.77360+-	.07675	3.36998+-	.42133	.72618+-	.05060	.94+-	.11	FE
28	NI			.00090+-	.00042	.00392+-	.00187	.00169+-	.00091	1.88+-	1.35	NI
29	CU			.17550+-	.01647	.76452+-	.09236	.12029+-	.00763	.69+-	.08	CU
30	ZN	*		.03000+-	.00280	.13069+-	.01574	.03346+-	.00280	1.12+-	.14	ZN
31	GA			<	.00020	<	.00185	.00026+-	.00025	1.32+-	3.07	GA
33	AS	*		.04450+-	.00546	.19385+-	.02800	.03059+-	.00398	.69+-	.12	AS
34	SE			.00720+-	.00095	.03136+-	.00477	.00007+-	.00029	.01+-	.04	SE
35	BR	*		.00360+-	.00089	.01568+-	.00407	.00033+-	.00266	.09+-	.74	BR
37	RB			<	.00010	<	.00279	.00212+-	.00017	21.20+-	135.73	RB
38	SR			.00400+-	.00086	.01742+-	.00397	.00367+-	.00024	.92+-	.21	SR
39	Y			<	.00000	<	.00402	.00095+-	.00024	.00+-	.00	Y
40	ZR			<	.00000	<	.01635	.00044+-	.00050	.00+-	.00	ZR
42	MO			<	.00000	<	.01082	.00281+-	.00034	.00+-	.00	MO
46	PD			<	.00000	<	.01017	.00003+-	.00028	.00+-	.00	PD
47	AG			<	.00000	<	.01361	.00014+-	.00036	.00+-	.00	AG
48	CD			<	.00000	<	.01758	.00325+-	.00064	.00+-	.00	CD
49	IN			<	.00000	<	.02164	.00030+-	.00060	.00+-	.00	IN
50	SN			<	.00000	<	.02656	.00136+-	.00070	.00+-	.00	SN
51	SB			<	.00000	<	.05784	.00531+-	.00162	.00+-	.00	SB
56	BA			<	.00000	<	.10954	.00013+-	.00295	.00+-	.00	BA
57	LA			<	.00000	<	.19954	.00397+-	.00526	.00+-	.00	LA
80	HG			<	.00030	<	.00185	.00003+-	.00024	.10+-	.83	HG
82	PB	*		.06530+-	.00641	.28446+-	.03532	.06837+-	.00586	1.05+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.6+- 1.0 COARSE: 13.3+- 1.4 TOTAL: 23.0+- 1.7

RESULTS FOR CMB SITE: HD 675 674 YEAR: 86 DATE: 1218
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9170
CHI SQUARE: 6.1770
DF: 7

#	TYPE	UG/M3		%	
5	5095	4.788+-	.592	44.186+-	7.230
13	KNECT	.449+-	.099	4.139+-	1.016
18	MTFF2	.190+-	.059	1.755+-	.573
28	DUSTO	1.851+-	.160	17.086+-	2.355
33	CONCO	.317+-	.090	2.926+-	.888
	TOTAL:	7.595+-	.609	70.091+-	9.385

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			10.83580+-	1.16170	100.00000+-	15.16170	7.59497+-	.60921	.70+-	.09	TOTAL
13	AL	*		.13940+-	.02110	1.28648+-	.23862	.21797+-	.01890	1.56+-	.27	AL
14	SI	*		.88800+-	.10170	8.19506+-	1.28561	.77901+-	.06957	.88+-	.13	SI
15	P			<	.00000	<	.04799	.00112+-	.00077	.00+-	.00	P
16	S	*		1.17160+-	.13360	10.81231+-	1.69230	1.17160+-	.04819	1.00+-	.12	S
17	CL			<	.00000	<	.04337	.00084+-	.00086	.00+-	.00	CL
19	K	*		.11350+-	.01320	1.04745+-	.16568	.06107+-	.00567	.54+-	.08	K
20	CA	*		.08710+-	.01010	.80382+-	.12694	.08408+-	.00644	.97+-	.13	CA
22	TI	*		.01060+-	.00140	.09782+-	.01664	.01240+-	.00113	1.17+-	.19	TI
23	V			.00070+-	.00040	.00646+-	.00376	.00026+-	.00016	.38+-	.31	V
24	CR			.00070+-	.00030	.00646+-	.00285	.00013+-	.00006	.19+-	.12	CR
25	MN	*		.00240+-	.00050	.02215+-	.00519	.00194+-	.00016	.81+-	.18	MN
26	FE	*		.11420+-	.01300	1.05391+-	.16480	.10629+-	.00930	.93+-	.13	FE
28	NI			.00090+-	.00030	.00831+-	.00291	.00028+-	.00020	.31+-	.25	NI
29	CU			.14330+-	.01610	1.32247+-	.20537	.01832+-	.00134	.13+-	.02	CU
30	ZN	*		.03080+-	.00370	.28424+-	.04577	.04377+-	.00305	1.42+-	.20	ZN
31	GA			.00070+-	.00060	.00646+-	.00558	.00010+-	.00022	.14+-	.34	GA
33	AS	*		.13210+-	.01730	1.21911+-	.20633	.09318+-	.00749	.71+-	.11	AS
34	SE			.01070+-	.00130	.09875+-	.01600	.00001+-	.00030	.00+-	.03	SE
35	BR	*		.00260+-	.00220	.02399+-	.02047	.00001+-	.00541	.01+-	2.08	BR
37	RB			<	.00000	<	.00461	.00023+-	.00008	.00+-	.00	RB
38	SR			<	.00000	<	.00461	.00044+-	.00005	.00+-	.00	SR
39	Y			<	.00000	<	.00831	.00031+-	.00026	.00+-	.00	Y
40	ZR			<	.00000	<	.03045	.00008+-	.00031	.00+-	.00	ZR
42	MO			<	.00000	<	.01661	.00043+-	.00015	.00+-	.00	MO
46	PD			<	.00000	<	.01569	.00006+-	.00016	.00+-	.00	PD
47	AG			<	.00000	<	.02307	.00017+-	.00018	.00+-	.00	AG
48	CD			<	.00000	<	.02953	.00573+-	.00050	.00+-	.00	CD
49	IN			<	.00000	<	.03507	.00017+-	.00033	.00+-	.00	IN
50	SN			<	.00000	<	.04430	.00197+-	.00042	.00+-	.00	SN
51	SB			<	.00000	<	.09967	.00772+-	.00102	.00+-	.00	SB
56	BA			<	.00000	<	.18365	.00024+-	.00155	.00+-	.00	BA
57	LA			<	.00000	<	.33039	.00114+-	.00304	.00+-	.00	LA
80	HG			.00050+-	.00040	.00461+-	.00372	.00001+-	.00046	.02+-	.92	HG
82	PB		*	.15520+-	.01760	1.43229+-	.22352	.10194+-	.00794	.66+-	.09	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.8+- 1.2 COARSE: 14.7+- 1.5 TOTAL: 25.5+- 1.9

RESULTS FOR THE SITE: MD 675 674 YEAR: 86 DATE: 1215
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9753
CHI SQUARE: 1.6260
DF: 7

#	TYPE	UG/M3		%	
5	5095	1.206+-	.217	8.231+-	1.709
13	KNECT	8.017+-	1.150	54.692+-	9.689
18	MTFF2	.025+-	.015	.168+-	.107
28	DUSTO	6.590+-	.863	44.961+-	7.519
33	CONCO	.087+-	.020	.596+-	.150
	TOTAL:	15.925+-	.871	108.648+-	12.766

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			14.65770+-	1.52420	100.00000+-	14.70588	15.92532+-	.87125	1.09+-	.13	TOTAL
13	AL	*		.70020+-	.09110	4.77701+-	.79564	.84639+-	.05992	1.21+-	.18	AL
14	SI	*		3.26390+-	.37410	22.26748+-	3.44609	2.95174+-	.21112	.90+-	.12	SI
15	P			<	.00000	<	.03207	.00442+-	.00203	.00+-	.00	P
16	S	*		.39460+-	.04960	2.69210+-	.43917	.39460+-	.01464	1.00+-	.13	S
17	CL			.01870+-	.00520	.12758+-	.03788	.01591+-	.00184	.85+-	.26	CL
19	K	*		.27300+-	.03130	1.86250+-	.28829	.30085+-	.02426	1.10+-	.15	K
20	CA	*		1.00970+-	.11330	6.88853+-	1.05385	1.10186+-	.10196	1.09+-	.16	CA
22	TI	*		.06690+-	.01520	.45642+-	.11404	.08691+-	.00691	1.30+-	.31	TI
23	V			<	.00480	<	.03360	.00253+-	.00061	.53+-	.55	V
24	CR			<	.00000	<	.00341	.00151+-	.00017	.00+-	.00	CR
25	MN	*		.01470+-	.00180	.10029+-	.01611	.01180+-	.00084	.80+-	.11	MN
26	FE	*		.84690+-	.09520	5.77785+-	.88477	.62778+-	.04521	.74+-	.10	FE
28	NI			.00080+-	.00040	.00546+-	.00279	.00141+-	.00071	1.76+-	1.25	NI
29	CU			.39790+-	.04490	2.71461+-	.41655	.10853+-	.00749	.27+-	.04	CU
30	ZN	*		.01410+-	.00270	.09620+-	.02096	.01273+-	.00092	.90+-	.18	ZN
31	GA			<	.00000	<	.00205	.00024+-	.00013	.00+-	.00	GA
33	AS	*		.01830+-	.00390	.12485+-	.02961	.01880+-	.00270	1.03+-	.26	AS
34	SE			<	.00000	<	.00205	.00010+-	.00020	.00+-	.00	SE
35	BR	*		<	.00000	<	.00273	.00035+-	.00217	.00+-	.00	BR
37	RB			<	.00000	<	.00273	.00180+-	.00014	.00+-	.00	RB
38	SR			.00220+-	.00050	.01501+-	.00375	.00402+-	.00030	1.83+-	.44	SR
39	Y			<	.00000	<	.00409	.00089+-	.00018	.00+-	.00	Y
40	ZR			<	.00000	<	.01978	.00064+-	.00044	.00+-	.00	ZR
42	MO			<	.00000	<	.01023	.00197+-	.00029	.00+-	.00	MO
46	PD			<	.00000	<	.01023	.00000+-	.00025	.00+-	.00	PD
47	AG			<	.00000	<	.01364	.00003+-	.00033	.00+-	.00	AG
48	CD			<	.00000	<	.01842	.00112+-	.00046	.00+-	.00	CD
49	IN			<	.00000	<	.02251	.00044+-	.00051	.00+-	.00	IN
50	SN			<	.00000	<	.02661	.00104+-	.00060	.00+-	.00	SN
51	SB			<	.00000	<	.06072	.00375+-	.00141	.00+-	.00	SB
56	BA			<	.00000	<	.11052	.00000+-	.00262	.00+-	.00	BA
57	LA			<	.00000	<	.20194	.00562+-	.00450	.00+-	.00	LA
80	HG			<	.00000	<	.00205	.00004+-	.00019	.00+-	.00	HG
82	PB	*		.03040+-	.00420	.20740+-	.03586	.03141+-	.00259	1.03+-	.17	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.8+- 1.2 COARSE: 14.7+- 1.5 TOTAL: 25.5+- 1.9

RESULTS FOR CMB SITE: HD 675 674 YEAR: 86 DATE: 1218
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9753
CHI SQUARE: 1.6260
DF: 7

#	TYPE	UG/M3		%	
5	5095	5.994+-	.630	23.513+-	3.039
13	KNECT	8.465+-	1.154	33.205+-	5.170
18	MTFF2	.215+-	.061	.843+-	.246
28	DUSTO	8.442+-	.878	33.113+-	4.249
33	CONCO	.404+-	.092	1.586+-	.381
	TOTAL:	23.520+-	1.063	92.260+-	8.093

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			25.49350+-	1.91644	100.00000+-	10.63115	23.52029+-	1.06312	.92+-	.08	TOTAL
13	AL		*	.83960+-	.09351	3.29339+-	.44254	1.06436+-	.06283	1.27+-	.16	AL
14	SI		*	4.15190+-	.38768	16.28611+-	1.95227	3.73075+-	.22228	.90+-	.10	SI
15	P			<	.00000	<	.02749	.00554+-	.00217	.00+-	.00	P
16	S		*	1.56620+-	.14251	6.14353+-	.72510	1.56620+-	.05037	1.00+-	.10	S
17	CL			.01870+-	.00701	.07335+-	.02804	.01674+-	.00203	.90+-	.35	CL
19	K		*	.38650+-	.03397	1.51607+-	.17534	.36192+-	.02491	.94+-	.10	K
20	CA		*	1.09680+-	.11375	4.30227+-	.55108	1.18595+-	.10216	1.08+-	.15	CA
22	TI		*	.07750+-	.01526	.30400+-	.06409	.09930+-	.00701	1.28+-	.27	TI
23	V			.00550+-	.00492	.02157+-	.01935	.00280+-	.00063	.51+-	.47	V
24	CR			.00070+-	.00058	.00275+-	.00230	.00165+-	.00018	2.35+-	1.98	CR
25	MN		*	.01710+-	.00187	.06708+-	.00890	.01375+-	.00085	.80+-	.10	MN
26	FE		*	.96110+-	.09608	3.76998+-	.47156	.73406+-	.04616	.76+-	.09	FE
28	NI			.00170+-	.00050	.00667+-	.00202	.00169+-	.00074	.99+-	.52	NI
29	CU			.54120+-	.04770	2.12289+-	.24592	.12684+-	.00761	.23+-	.02	CU
30	ZN		*	.04490+-	.00458	.17612+-	.02232	.05651+-	.00319	1.26+-	.15	ZN
31	GA			.00070+-	.00067	.00275+-	.00264	.00034+-	.00026	.48+-	.59	GA
33	AS		*	.15040+-	.01773	.58995+-	.08250	.11198+-	.00796	.74+-	.10	AS
34	SE			.01070+-	.00133	.04197+-	.00611	.00011+-	.00036	.01+-	.03	SE
35	BR		*	.00260+-	.00224	.01020+-	.00880	.00036+-	.00583	.14+-	2.25	BR
37	RB			<	.00000	<	.00251	.00203+-	.00016	.00+-	.00	RB
38	SR			.00220+-	.00071	.00863+-	.00285	.00446+-	.00030	2.03+-	.67	SR
39	Y			<	.00000	<	.00424	.00120+-	.00031	.00+-	.00	Y
40	ZR			<	.00000	<	.01723	.00072+-	.00054	.00+-	.00	ZR
42	MO			<	.00000	<	.00919	.00240+-	.00033	.00+-	.00	MO
46	PD			<	.00000	<	.00889	.00006+-	.00030	.00+-	.00	PD
47	AG			<	.00000	<	.01256	.00020+-	.00037	.00+-	.00	AG
48	CD			<	.00000	<	.01642	.00685+-	.00068	.00+-	.00	CD
49	IN			<	.00000	<	.01974	.00061+-	.00061	.00+-	.00	IN
50	SN			<	.00000	<	.02426	.00301+-	.00073	.00+-	.00	SN
51	SB			<	.00000	<	.05489	.01147+-	.00174	.00+-	.00	SB
56	BA			<	.00000	<	.10065	.00024+-	.00304	.00+-	.00	BA
57	LA			<	.00000	<	.18221	.00676+-	.00543	.00+-	.00	LA
80	HG			.00050+-	.00050	.00196+-	.00197	.00005+-	.00050	.10+-	1.00	HG
82	PB		*	.18560+-	.01809	.72803+-	.08963	.13335+-	.00835	.72+-	.08	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.8+- 1.2 COARSE: 14.7+- 1.5 TOTAL: 25.5+- 1.9

RESULTS FOR CMB SITE GR 750 779 YEAR 87 DATE 0127
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9699
CHI SQUARE: 1.7436
DF: 8

#	TYPE	UG/M3		%	
5	5095	2.818+-	.387	31.067+-	5.469
13	KNECT	1.085+-	.211	11.958+-	2.672
24	SLPR2	.704+-	.068	7.763+-	1.138
28	DUSTO	3.153+-	.289	34.754+-	4.983
	TOTAL:	7.760+-	.462	85.542+-	10.721

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			9.07170+-	1.00050	100.00000+-	15.59708	7.76009+-	.46200	.86+-	.11	TOTAL
13	AL	*		.30980+-	.04070	3.41502+-	.58578	.39393+-	.03268	1.27+-	.20	AL
14	SI	*		1.14450+-	.13110	12.61616+-	2.00611	1.39040+-	.11972	1.21+-	.17	SI
15	P			<	.00000	<	.05842	.00221+-	.00293	.00+-	.00	P
16	S	*		.72080+-	.08580	7.94559+-	1.28936	.72080+-	.03530	1.00+-	.13	S
17	CL			<	.00000	<	.05842	.00203+-	.00331	.00+-	.00	CL
19	K	*		.11260+-	.01310	1.24122+-	.19898	.10705+-	.00968	.95+-	.14	K
20	CA	*		.18110+-	.02060	1.99632+-	.31629	.18477+-	.01560	1.02+-	.14	CA
22	TI	*		.02530+-	.00570	.27889+-	.06996	.02190+-	.00196	.87+-	.21	TI
23	V			.00230+-	.00230	.02535+-	.02551	.00052+-	.00027	.23+-	.26	V
24	CR			<	.00000	<	.00331	.00027+-	.00012	.00+-	.00	CR
25	MN	*		.00560+-	.00080	.06173+-	.01114	.00359+-	.00030	.64+-	.11	MN
26	FE	*		.24580+-	.02770	2.70953+-	.42724	.19073+-	.01602	.78+-	.11	FE
28	NI			.00080+-	.00030	.00882+-	.00345	.00043+-	.00055	.54+-	.72	NI
29	CU			.20620+-	.02320	2.27300+-	.35811	.03050+-	.00234	.15+-	.02	CU
30	ZN	*		.11650+-	.01320	1.28421+-	.20306	.12587+-	.01246	1.08+-	.16	ZN
31	GA			<	.00000	<	.00992	.00004+-	.00064	.00+-	.00	GA
33	AS	*		.09780+-	.01690	1.07808+-	.22100	.09326+-	.01277	.95+-	.21	AS
34	SE			.01930+-	.00230	.21275+-	.03454	.00003+-	.00082	.00+-	.04	SE
35	BR	*		<	.00000	<	.00772	.00004+-	.00715	.00+-	.00	BR
37	RB			<	.00000	<	.00441	.00042+-	.00013	.00+-	.00	RB
38	SR			.00050+-	.00040	.00551+-	.00445	.00084+-	.00011	1.69+-	1.37	SR
39	Y			<	.00000	<	.00992	.00089+-	.00069	.00+-	.00	Y
40	ZR			<	.00000	<	.02646	.00016+-	.00051	.00+-	.00	ZR
42	MO			.00370+-	.00370	.04079+-	.04103	.00221+-	.00034	.60+-	.60	MO
46	PD			<	.00000	<	.01543	.00014+-	.00027	.00+-	.00	PD
47	AG			<	.00000	<	.02205	.00002+-	.00033	.00+-	.00	AG
48	CD			<	.00000	<	.02646	.01092+-	.00122	.00+-	.00	CD
49	IN			<	.00000	<	.03307	.00000+-	.00061	.00+-	.00	IN
50	SN			<	.00000	<	.03968	.00542+-	.00091	.00+-	.00	SN
51	SB			<	.00000	<	.09039	.01083+-	.00193	.00+-	.00	SB
56	BA			<	.00000	<	.16314	.00057+-	.00272	.00+-	.00	BA
57	LA			<	.00000	<	.30535	.00277+-	.00534	.00+-	.00	LA
80	HG			<	.00000	<	.00441	.00002+-	.00077	.00+-	.00	HG
82	PB	*		.22990+-	.02590	2.53425+-	.39954	.21655+-	.02159	.94+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.1+- 1.0 COARSE: 22.9+- 2.3 TOTAL: 31.9+- 2.5

RESULTS FOR CMB SITE: GR 780 779 YEAR: 87 DATE: 0127
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9584
CHI SQUARE: 2.8400
DF: 7

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.680+-	.521	7.348+-	2.397
13	KNECT	3.758+-	1.414	16.432+-	6.404
22	2NCD3	.173+-	.039	.758+-	.187
24	SLPR2	.000+-	.000	.000+-	.000
26	CNORM	1.012+-	.206	4.426+-	1.006
28	OUSTO	15.687+-	1.303	68.593+-	9.007
	TOTAL:	22.311+-	1.180	97.557+-	11.181

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			22.86920+-	2.32550	100.00000+-	14.38071	22.31059+-	1.17971	.98+-	.11	TOTAL
13	AL	*		1.34240+-	.16990	5.86990+-	.95300	1.25355+-	.10758	.93+-	.14	AL
14	SI	*		5.36100+-	.61140	23.44201+-	3.58185	4.66966+-	.40900	.87+-	.13	SI
15	P			<	.00000	<	.03192	.00207+-	.00431	.00+-	.00	P
16	S	*		.69130+-	.08100	3.02284+-	.46897	.61790+-	.04392	.89+-	.12	S
17	CL			.02480+-	.00590	.10844+-	.02806	.00746+-	.00262	.30+-	.13	CL
19	K	*		.40320+-	.04580	1.76307+-	.26879	.59023+-	.05556	1.46+-	.22	K
20	CA	*		.97090+-	.10930	4.24545+-	.64404	1.08335+-	.06500	1.12+-	.14	CA
22	TI	*		.15010+-	.01700	.65634+-	.09990	.16745+-	.01570	1.12+-	.16	TI
23	V			<	.00770	<	.03515	.00301+-	.00132	.39+-	.44	V
24	CR			<	.00000	<	.00262	.00167+-	.00031	.00+-	.00	CR
25	MN	*		.02510+-	.00290	.10975+-	.01689	.01630+-	.00135	.65+-	.09	MN
26	FE	*		1.46530+-	.16480	6.40731+-	.97149	1.19186+-	.09225	.81+-	.11	FE
28	NI			.00090+-	.00050	.00394+-	.00222	.00311+-	.00201	3.45+-	2.94	NI
29	CU			.67800+-	.07640	2.96469+-	.44999	.38597+-	.02655	.57+-	.08	CU
30	ZN	*		.05700+-	.00760	.24924+-	.04179	.06164+-	.00503	1.08+-	.17	ZN
31	GA			<	.00000	<	.00175	.00011+-	.00030	.00+-	.00	GA
33	AS	*		.01340+-	.00480	.05859+-	.02182	.01618+-	.00721	1.21+-	.69	AS
34	SE			<	.00000	<	.00175	.00020+-	.00076	.00+-	.00	SE
35	BR	*		<	.00030	<	.00219	.00048+-	.00301	1.60+-	10.39	BR
37	RB			.00250+-	.00050	.01093+-	.00245	.00335+-	.00032	1.34+-	.30	RB
38	SR			.00730+-	.00100	.03192+-	.00545	.00464+-	.00039	.64+-	.10	SR
39	Y			<	.00000	<	.00262	.00098+-	.00039	.00+-	.00	Y
40	ZR			<	.00000	<	.01006	.00029+-	.00075	.00+-	.00	ZR
42	MO			.01330+-	.00210	.05816+-	.01092	.00616+-	.00057	.46+-	.08	MO
46	PD			<	.00000	<	.00612	.00000+-	.00042	.00+-	.00	PD
47	AG			<	.00000	<	.00787	.00027+-	.00057	.00+-	.00	AG
48	CD			<	.00000	<	.01137	.00151+-	.00085	.00+-	.00	CD
49	IN			<	.00000	<	.01356	.00018+-	.00090	.00+-	.00	IN
50	SN			<	.00000	<	.01574	.00098+-	.00104	.00+-	.00	SN
51	SB			<	.00000	<	.03498	.00333+-	.00245	.00+-	.00	SB
56	BA			<	.00000	<	.06472	.00000+-	.00446	.00+-	.00	BA
57	LA			<	.00000	<	.12112	.00263+-	.00764	.00+-	.00	LA
80	HG			<	.00000	<	.00131	.00002+-	.00024	.00+-	.00	HG
82	PB		*	.04850+-	.00640	.21208+-	.03533	.04641+-	.00636	.96+-	.18	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.1+- 1.0 COARSE: 22.9+- 2.3 TOTAL: 31.9+- 2.5

RESULTS FOR CMB SITE: GR 679 678 YEAR: 86 DATE: 1218
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9556
CHI SQUARE: 2.2877
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.424+-	.481	4.040+-	1.424
13	KNECT	2.778+-	1.473	7.879+-	4.254
17	MTFF1	.000+-	.000	.000+-	.000
22	2NCD3	.201+-	.035	.569+-	.116
28	DUSTO	34.282+-	2.475	97.246+-	12.036
	TOTAL:	38.684+-	2.272	109.734+-	12.775

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			35.25270+-	3.54370	100.00000+-	14.21607	38.68420+-	2.27196	1.10+-	.13	TOTAL
13	AL		*	2.14380+-	.27360	6.08124+-	.98795	2.45295+-	.23181	1.14+-	.18	AL
14	SI		*	9.95240+-	1.11590	28.23160+-	4.25132	9.27806+-	.88553	.93+-	.14	SI
15	P			<	.00000	<	.03120	.00153+-	.00864	.00+-	.00	P
16	S		*	.59760+-	.07150	1.69519+-	.26490	.57500+-	.04792	.96+-	.14	S
17	CL			.01000+-	.00600	.02837+-	.01726	.00551+-	.00424	.55+-	.54	CL
19	K		*	.95640+-	.10760	2.71298+-	.40931	1.23556+-	.12124	1.29+-	.19	K
20	CA		*	1.08400+-	.12180	3.07494+-	.46359	1.13083+-	.06592	1.04+-	.13	CA
22	TI		*	.27430+-	.06190	.77810+-	.19222	.34974+-	.03426	1.28+-	.31	TI
23	V			<	.01160	<	.03364	.00552+-	.00288	.48+-	.54	V
24	CR			<	.00000	<	.00227	.00215+-	.00066	.00+-	.00	CR
25	MN		*	.05410+-	.00620	.15346+-	.02339	.03106+-	.00289	.57+-	.08	MN
26	FE		*	2.37140+-	.26590	6.72686+-	1.01300	2.04919+-	.19642	.86+-	.13	FE
28	NI			.00160+-	.00060	.00454+-	.00176	.00391+-	.00367	2.44+-	2.47	NI
29	CU			.52180+-	.05870	1.48017+-	.22330	.30254+-	.02831	.58+-	.08	CU
30	ZN		*	.02480+-	.00400	.07035+-	.01337	.02165+-	.00253	.87+-	.17	ZN
31	GA			<	.00000	<	.00113	.00008+-	.00038	.00+-	.00	GA
33	AS		*	.01790+-	.00420	.05078+-	.01296	.01537+-	.00835	.86+-	.51	AS
34	SE			.00110+-	.00030	.00312+-	.00091	.00003+-	.00089	.03+-	.81	SE
35	BR		*	<	.00000	<	.00142	.00092+-	.00356	.00+-	.00	BR
37	RB			.00420+-	.00060	.01191+-	.00208	.00677+-	.00065	1.61+-	.28	RB
38	SR			.00490+-	.00080	.01390+-	.00266	.00802+-	.00073	1.64+-	.31	SR
39	Y			.00170+-	.00070	.00482+-	.00204	.00179+-	.00057	1.05+-	.55	Y
40	ZR			<	.00000	<	.00908	.00022+-	.00156	.00+-	.00	ZR
42	MO			.01050+-	.00200	.02978+-	.00641	.00971+-	.00117	.92+-	.21	MO
46	PD			<	.00000	<	.00482	.00000+-	.00089	.00+-	.00	PD
47	AG			<	.00000	<	.00624	.00004+-	.00121	.00+-	.00	AG
48	CD			<	.00000	<	.00794	.00124+-	.00163	.00+-	.00	CD
49	IN			<	.00000	<	.00964	.00013+-	.00193	.00+-	.00	IN
50	SN			<	.00000	<	.01220	.00103+-	.00218	.00+-	.00	SN
51	SB			<	.00000	<	.02723	.00350+-	.00506	.00+-	.00	SB
56	BA			<	.00000	<	.04964	.00000+-	.00955	.00+-	.00	BA
57	LA			<	.00000	<	.08709	.00195+-	.01636	.00+-	.00	LA
80	HG			<	.00000	<	.00085	.00001+-	.00032	.00+-	.00	HG
82	PB		*	.04510+-	.00570	.12793+-	.02066	.04895+-	.00736	1.09+-	.21	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.7+- 1.2 COARSE: 35.3+- 3.5 TOTAL: 46.9+- 3.8

RESULTS FOR CMB SITE: GR 679 678 YEAR: 86 DATE: 1218
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9493
CHI SQUARE: 3.8782
DF: 7

#	TYPE	UG/M3		%	
5	5095	4.027+-	.547	34.470+-	5.938
7	GYPSU	.332+-	.091	2.842+-	.831
17	MTFF1	.146+-	.043	1.253+-	.392
22	2NCD3	.262+-	.062	2.241+-	.585
28	DUSTO	5.374+-	.348	46.000+-	5.710
	TOTAL:	10.141+-	.635	86.807+-	10.683

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			11.68190+-	1.23760	100.00000+-	14.98242	10.14074+-	.63503	.87+-	.11	TOTAL
13	AL	*		.43170+-	.05480	3.69546+-	.61101	.54047+-	.05405	1.25+-	.20	AL
14	SI	*		1.94240+-	.22020	16.62743+-	2.57995	2.00237+-	.20025	1.03+-	.16	SI
15	P			<	.00000	<	.05136	.00205+-	.00218	.00+-	.00	P
16	S	*		1.08440+-	.12340	9.28274+-	1.44325	1.08440+-	.04165	1.00+-	.12	S
17	CL			<	.00000	<	.03595	.00000+-	.00139	.00+-	.00	CL
19	K	*		.15520+-	.01780	1.32855+-	.20743	.16536+-	.01643	1.07+-	.16	K
20	CA	*		.15280+-	.01740	1.30801+-	.20344	.15280+-	.01087	1.00+-	.13	CA
22	TI	*		.03420+-	.00400	.29276+-	.04620	.03278+-	.00328	.96+-	.15	TI
23	V			.00170+-	.00060	.01455+-	.00536	.00047+-	.00045	.28+-	.28	V
24	CR			.00140+-	.00040	.01198+-	.00365	.00022+-	.00015	.16+-	.12	CR
25	MN	*		.00770+-	.00100	.06591+-	.01105	.00450+-	.00045	.58+-	.10	MN
26	FE	*		.28170+-	.03170	2.41142+-	.37269	.27107+-	.02670	.96+-	.14	FE
28	NI			.00050+-	.00030	.00428+-	.00261	.00071+-	.00059	1.42+-	1.46	NI
29	CU			.11240+-	.01270	.96217+-	.14903	.04382+-	.00378	.39+-	.06	CU
30	ZN	*		.02470+-	.00290	.21144+-	.03344	.03418+-	.00233	1.38+-	.19	ZN
31	GA			.00060+-	.00060	.00514+-	.00516	.00009+-	.00026	.15+-	.46	GA
33	AS	*		.10120+-	.01320	.86630+-	.14557	.06846+-	.00613	.68+-	.11	AS
34	SE			.00680+-	.00090	.05821+-	.00987	.00000+-	.00044	.00+-	.06	SE
35	BR	*		.00350+-	.00170	.02996+-	.01489	.00371+-	.00160	1.06+-	.69	BR
37	RB			<	.00000	<	.00342	.00055+-	.00013	.00+-	.00	RB
38	SR			<	.00000	<	.00428	.00091+-	.00015	.00+-	.00	SR
39	Y			<	.00000	<	.00599	.00065+-	.00031	.00+-	.00	Y
40	ZR			<	.00000	<	.02568	.00004+-	.00074	.00+-	.00	ZR
42	MO			<	.00000	<	.01370	.00032+-	.00041	.00+-	.00	MO
46	PD			<	.00000	<	.01455	.00000+-	.00044	.00+-	.00	PD
47	AG			<	.00000	<	.01969	.00018+-	.00050	.00+-	.00	AG
48	CD			<	.00000	<	.02654	.00475+-	.00081	.00+-	.00	CD
49	IN			<	.00000	<	.03082	.00015+-	.00094	.00+-	.00	IN
50	SN			<	.00000	<	.03767	.00152+-	.00111	.00+-	.00	SN
51	SB			<	.00000	<	.08560	.00593+-	.00235	.00+-	.00	SB
56	BA			<	.00000	<	.15494	.00000+-	.00434	.00+-	.00	BA
57	LA			<	.00000	<	.28934	.00000+-	.00858	.00+-	.00	LA
80	HG			.00070+-	.00040	.00599+-	.00348	.00000+-	.00031	.00+-	.45	HG
82	PB		*	.11820+-	.01340	1.01182+-	.15700	.08554+-	.00692	.72+-	.10	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.7+- 1.2 COARSE: 35.3+- 3.5 TOTAL: 46.9+- 3.8

RESULTS FOR CMB SITE: GR 679 675 YEAR: 86 DATE: 1218
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9556
CHI SQUARE: 2.2877
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.424+-	.481	4.040+-	1.424
13	KNECT	2.778+-	1.473	7.879+-	4.254
17	MTFF1	.000+-	.000	.000+-	.000
22	2NCD3	.201+-	.035	.569+-	.116
28	DUSTO	34.282+-	2.475	97.246+-	12.036
	TOTAL:	38.684+-	2.272	109.734+-	12.775

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			35.25270+-	3.54370	100.00000+-	14.21607	38.68420+-	2.27196	1.10+-	.13	TOTAL
13	AL	*		2.14380+-	.27360	6.08124+-	.98795	2.45295+-	.23181	1.14+-	.18	AL
14	SI	*		9.95240+-	1.11590	28.23160+-	4.25132	9.27806+-	.88553	.93+-	.14	SI
15	P			<	.00000	<	.03120	.00153+-	.00864	.00+-	.00	P
16	S	*		.59760+-	.07150	1.69519+-	.26490	.57500+-	.04792	.96+-	.14	S
17	CL			.01000+-	.00600	.02837+-	.01726	.00551+-	.00424	.55+-	.54	CL
19	K	*		.95640+-	.10760	2.71298+-	.40931	1.23556+-	.12124	1.29+-	.19	K
20	CA	*		1.08400+-	.12180	3.07494+-	.46359	1.13083+-	.06592	1.04+-	.13	CA
22	TI	*		.27430+-	.06190	.77810+-	.19222	.34974+-	.03426	1.28+-	.31	TI
23	V			<	.01160	<	.03364	.00552+-	.00288	.48+-	.54	V
24	CR			<	.00000	<	.00227	.00215+-	.00066	.00+-	.00	CR
25	MN	*		.05410+-	.00620	.15346+-	.02339	.03106+-	.00289	.57+-	.08	MN
26	FE	*		2.37140+-	.26590	6.72686+-	1.01300	2.04919+-	.19642	.86+-	.13	FE
28	NI			.00160+-	.00060	.00454+-	.00176	.00391+-	.00367	2.44+-	2.47	NI
29	CU			.52180+-	.05870	1.48017+-	.22330	.30254+-	.02831	.58+-	.08	CU
30	ZN	*		.02480+-	.00400	.07035+-	.01337	.02165+-	.00253	.87+-	.17	ZN
31	GA			<	.00000	<	.00113	.00008+-	.00038	.00+-	.00	GA
33	AS	*		.01790+-	.00420	.05078+-	.01296	.01537+-	.00835	.86+-	.51	AS
34	SE			.00110+-	.00030	.00312+-	.00091	.00003+-	.00089	.03+-	.81	SE
35	BR	*		<	.00000	<	.00142	.00092+-	.00356	.00+-	.00	BR
37	RB			.00420+-	.00060	.01191+-	.00208	.00677+-	.00065	1.61+-	.28	RB
38	SR			.00490+-	.00080	.01390+-	.00266	.00802+-	.00073	1.64+-	.31	SR
39	Y			.00170+-	.00070	.00482+-	.00204	.00179+-	.00057	1.05+-	.55	Y
40	ZR			<	.00000	<	.00908	.00022+-	.00156	.00+-	.00	ZR
42	MO			.01050+-	.00200	.02978+-	.00641	.00971+-	.00117	.92+-	.21	MO
46	PD			<	.00000	<	.00482	.00000+-	.00089	.00+-	.00	PD
47	AG			<	.00000	<	.00624	.00004+-	.00121	.00+-	.00	AG
48	CD			<	.00000	<	.00794	.00124+-	.00163	.00+-	.00	CD
49	IN			<	.00000	<	.00964	.00013+-	.00193	.00+-	.00	IN
50	SN			<	.00000	<	.01220	.00103+-	.00218	.00+-	.00	SN
51	SB			<	.00000	<	.02723	.00350+-	.00506	.00+-	.00	SB
56	BA			<	.00000	<	.04964	.00000+-	.00955	.00+-	.00	BA
57	LA			<	.00000	<	.08709	.00195+-	.01636	.00+-	.00	LA
80	HG			<	.00000	<	.00085	.00001+-	.00032	.00+-	.00	HG
82	PB	*		.04510+-	.00570	.12793+-	.02066	.04895+-	.00736	1.09+-	.21	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.7+- 1.2 COARSE: 35.3+- 3.5 TOTAL: 46.9+- 3.8

RESULTS FOR CMB SITE: GR 679 678 YEAR: 86 DATE: 1218
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9556
CHI SQUARE: 2.2877
DF: 8

#	TYPE	UG/M3		%	
5	5095	4.027+-	.547	8.580+-	1.352
7	GYPSU	1.756+-	.490	3.742+-	1.085
13	KNECT	2.778+-	1.473	5.918+-	3.175
17	MTFF1	.146+-	.043	.312+-	.095
22	2NCD3	.462+-	.072	.985+-	.172
28	DUSTO	39.655+-	2.500	84.491+-	8.604
	TOTAL:	48.825+-	2.359	104.028+-	9.720

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			46.93460+-	3.75359	100.00000+-	11.31017	48.82494+-	2.35904	1.04+-	.10	TOTAL
13	AL		*	2.57550+-	.27903	5.48742+-	.73895	2.99342+-	.23803	1.16+-	.16	AL
14	SI		*	11.89480+-	1.13742	25.34335+-	3.15927	11.28043+-	.90789	.95+-	.12	SI
15	P			<	.00000	<	.02670	.00358+-	.00891	.00+-	.00	P
16	S		*	1.68200+-	.14262	3.58371+-	.41770	1.65940+-	.06349	.99+-	.09	S
17	CL			.01000+-	.00732	.02131+-	.01570	.00551+-	.00446	.55+-	.60	CL
19	K		*	1.11160+-	.10906	2.36840+-	.29979	1.40093+-	.12235	1.26+-	.17	K
20	CA		*	1.23680+-	.12304	2.63516+-	.33635	1.28363+-	.06681	1.04+-	.12	CA
22	TI		*	.30850+-	.06203	.65730+-	.14223	.38253+-	.03441	1.24+-	.27	TI
23	V			.01330+-	.01182	.02834+-	.02528	.00599+-	.00292	.45+-	.46	V
24	CR			.00140+-	.00089	.00298+-	.00192	.00237+-	.00067	1.70+-	1.18	CR
25	MN		*	.06180+-	.00628	.13167+-	.01703	.03556+-	.00292	.58+-	.08	MN
26	FE		*	2.65310+-	.26778	5.65276+-	.72794	2.32026+-	.19823	.87+-	.12	FE
28	NI			.00210+-	.00067	.00447+-	.00147	.00462+-	.00372	2.20+-	1.90	NI
29	CU			.63420+-	.06006	1.35124+-	.16749	.34636+-	.02856	.55+-	.07	CU
30	ZN		*	.04950+-	.00494	.10547+-	.01349	.05583+-	.00344	1.13+-	.13	ZN
31	GA			<	.00060	<	.00154	.00018+-	.00046	.29+-	.85	GA
33	AS		*	.11910+-	.01385	.25376+-	.03582	.08383+-	.01036	.70+-	.12	AS
34	SE			.00790+-	.00095	.01683+-	.00243	.00003+-	.00099	.00+-	.13	SE
35	BR		*	.00350+-	.00177	.00746+-	.00382	.00463+-	.00390	1.32+-	1.30	BR
37	RB			.00420+-	.00072	.00895+-	.00169	.00732+-	.00067	1.74+-	.34	RB
38	SR			.00490+-	.00094	.01044+-	.00218	.00893+-	.00074	1.82+-	.38	SR
39	Y			.00170+-	.00099	.00362+-	.00213	.00244+-	.00065	1.44+-	.92	Y
40	ZR			<	.00000	<	.00935	.00025+-	.00173	.00+-	.00	ZR
42	MO			.01050+-	.00256	.02237+-	.00574	.01003+-	.00124	.96+-	.26	MO
46	PD			<	.00000	<	.00512	.00000+-	.00100	.00+-	.00	PD
47	AG			<	.00000	<	.00678	.00022+-	.00131	.00+-	.00	AG
48	CD			<	.00000	<	.00890	.00599+-	.00182	.00+-	.00	CD
49	IN			<	.00000	<	.01055	.00028+-	.00214	.00+-	.00	IN
50	SN			<	.00000	<	.01311	.00254+-	.00245	.00+-	.00	SN
51	SB			<	.00000	<	.02954	.00943+-	.00558	.00+-	.00	SB
56	BA			<	.00000	<	.05364	.00000+-	.01049	.00+-	.00	BA
57	LA			<	.00000	<	.09729	.00195+-	.01847	.00+-	.00	LA
80	HG			.00070+-	.00050	.00149+-	.00107	.00001+-	.00045	.02+-	.64	HG
82	PB		*	.16330+-	.01456	.34793+-	.04168	.13449+-	.01011	.82+-	.10	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.7+- 1.2 COARSE: 35.3+- 3.5 TOTAL: 46.9+- 3.8

RESULTS FOR THE SITE: [illegible] YEAR: 86 DATE: 1224
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9344
CHI SQUARE: 3.7606
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.068+-	.671	38.704+-	6.532
7	GYPSU	.487+-	.090	3.719+-	.787
22	2NCD3	.465+-	.049	3.553+-	.528
28	DUSTO	2.526+-	.173	19.290+-	2.413
	TOTAL:	8.545+-	.689	65.265+-	8.621

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			13.09330+-	1.36970	100.00000+-	14.79420	8.54531+-	.68927	.65+-	.09	TOTAL
13	AL	*		.17770+-	.02460	1.35718+-	.23549	.25402+-	.02541	1.43+-	.24	AL
14	SI	*		1.01980+-	.11640	7.78872+-	1.20590	.94112+-	.09418	.92+-	.14	SI
15	P			<	.00000	<	.04582	.00096+-	.00160	.00+-	.00	P
16	S	*		1.33320+-	.15130	10.18231+-	1.57159	1.33320+-	.05277	1.00+-	.12	S
17	CL			<	.00390	<	.03755	.00000+-	.00180	.00+-	.46	CL
19	K	*		.14280+-	.01650	1.09063+-	.16999	.07818+-	.00773	.55+-	.08	K
20	CA	*		.14890+-	.01690	1.13722+-	.17554	.14890+-	.01199	1.00+-	.14	CA
22	TI	*		.01270+-	.00160	.09700+-	.01588	.01541+-	.00154	1.21+-	.20	TI
23	V			.00040+-	.00040	.00305+-	.00307	.00022+-	.00021	.55+-	.76	V
24	CR			.00040+-	.00030	.00305+-	.00231	.00009+-	.00009	.23+-	.28	CR
25	MN	*		.00350+-	.00060	.02673+-	.00537	.00211+-	.00021	.60+-	.12	MN
26	FE	*		.12370+-	.01410	.94476+-	.14617	.12568+-	.01255	1.02+-	.15	FE
28	NI			.00060+-	.00030	.00458+-	.00234	.00049+-	.00028	.82+-	.62	NI
29	CU			.06030+-	.00680	.46054+-	.07084	.02025+-	.00178	.34+-	.05	CU
30	ZN	*		.02810+-	.00330	.21461+-	.03375	.03306+-	.00323	1.18+-	.18	ZN
31	GA			.00110+-	.00070	.00840+-	.00542	.00016+-	.00039	.15+-	.37	GA
33	AS	*		.02880+-	.00930	.21996+-	.07466	.03578+-	.00676	1.24+-	.46	AS
34	SE			.00670+-	.00090	.05117+-	.00871	.00000+-	.00074	.00+-	.11	SE
35	BR	*		.00430+-	.00120	.03284+-	.00979	.00000+-	.00275	.00+-	.64	BR
37	RB			<	.00000	<	.00382	.00026+-	.00007	.00+-	.00	RB
38	SR			<	.00000	<	.00382	.00043+-	.00008	.00+-	.00	SR
39	Y			<	.00000	<	.00611	.00058+-	.00038	.00+-	.00	Y
40	ZR			<	.00000	<	.02444	.00007+-	.00036	.00+-	.00	ZR
42	MO			<	.00000	<	.01298	.00015+-	.00020	.00+-	.00	MO
46	PD			<	.00000	<	.01451	.00000+-	.00021	.00+-	.00	PD
47	AG			<	.00000	<	.01757	.00026+-	.00024	.00+-	.00	AG
48	CD			<	.00000	<	.02673	.00407+-	.00054	.00+-	.00	CD
49	IN			<	.00000	<	.02902	.00019+-	.00044	.00+-	.00	IN
50	SN			<	.00000	<	.03437	.00159+-	.00054	.00+-	.00	SN
51	SB			<	.00000	<	.07714	.00535+-	.00123	.00+-	.00	SB
56	BA			<	.00000	<	.14435	.00000+-	.00204	.00+-	.00	BA
57	LA			<	.00000	<	.26349	.00000+-	.00403	.00+-	.00	LA
80	HG			<	.00000	<	.00305	.00000+-	.00015	.00+-	.00	HG
82	PB	*		.15350+-	.01740	1.17236+-	.18083	.11883+-	.01186	.77+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.1+- 1.4 COARSE: 32.3+- 3.3 TOTAL: 45.4+- 3.5

RESULTS FOR CMB SITE: MD 687 686 YEAR: 86 DATE: 1224
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9821
CHI SQUARE: .9652
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.615+-	.403	4.998+-	1.343
13	KNECT	24.238+-	3.246	74.985+-	12.560
22	2NCD3	.179+-	.032	.553+-	.113
28	DUSTO	6.071+-	1.762	18.782+-	5.770
	TOTAL:	32.103+-	2.037	99.318+-	11.816

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			32.32410+-	3.25300	100.00000+-	14.23222	32.10349+-	2.03720	.99+-	.12	TOTAL
13	AL	*		1.23030+-	.15590	3.80614+-	.61590	1.62394+-	.12818	1.32+-	.20	AL
14	SI	*		5.41220+-	.61750	16.74354+-	2.54729	5.34982+-	.40955	.99+-	.14	SI
15	P			<	.00000	<	.02135	.01336+-	.00424	.00+-	.00	P
16	S	*		.49170+-	.06070	1.52116+-	.24228	.49957+-	.04158	1.02+-	.15	S
17	CL			.01480+-	.00720	.04579+-	.02275	.04809+-	.00521	3.25+-	1.62	CL
19	K	*		.45040+-	.05130	1.39339+-	.21178	.41825+-	.02959	.93+-	.12	K
20	CA	*		3.85460+-	.43110	11.92485+-	1.79413	3.52722+-	.30958	.92+-	.13	CA
22	TI	*		.11140+-	.02510	.34463+-	.08504	.12437+-	.00880	1.12+-	.26	TI
23	V			<	.00680	<	.02145	.00566+-	.00095	.83+-	.86	V
24	CR			<	.00000	<	.00186	.00385+-	.00039	.00+-	.00	CR
25	MN	*		.02580+-	.00300	.07982+-	.01227	.02398+-	.00196	.93+-	.13	MN
26	FE	*		1.22430+-	.13730	3.78758+-	.57071	1.10158+-	.08298	.90+-	.12	FE
28	NI			.00040+-	.00040	.00124+-	.00124	.00273+-	.00069	6.84+-	7.05	NI
29	CU			.39560+-	.04440	1.22385+-	.18449	.20776+-	.01637	.53+-	.07	CU
30	ZN	*		.02090+-	.00320	.06466+-	.01185	.01616+-	.00200	.77+-	.15	ZN
31	GA			<	.00000	<	.00124	.00073+-	.00031	.00+-	.00	GA
33	AS	*		.00940+-	.00370	.02908+-	.01181	.01355+-	.00745	1.44+-	.97	AS
34	SE			<	.00000	<	.00093	.00029+-	.00078	.00+-	.00	SE
35	BR	*		<	.00000	<	.00124	.00071+-	.00309	.00+-	.00	BR
37	RB			.00110+-	.00040	.00340+-	.00128	.00279+-	.00021	2.54+-	.94	RB
38	SR			.00910+-	.00120	.02815+-	.00467	.00928+-	.00081	1.02+-	.16	SR
39	Y			<	.00000	<	.00217	.00186+-	.00042	.00+-	.00	Y
40	ZR			<	.00000	<	.00990	.00189+-	.00101	.00+-	.00	ZR
42	MO			.00170+-	.00170	.00526+-	.00529	.00182+-	.00060	1.07+-	1.13	MO
46	PD			<	.00000	<	.00557	.00000+-	.00058	.00+-	.00	PD
47	AG			<	.00000	<	.00712	.00003+-	.00074	.00+-	.00	AG
48	CD			<	.00000	<	.00928	.00111+-	.00107	.00+-	.00	CD
49	IN			<	.00000	<	.01176	.00114+-	.00112	.00+-	.00	IN
50	SN			<	.00000	<	.01361	.00240+-	.00138	.00+-	.00	SN
51	SB			<	.00000	<	.03032	.00804+-	.00323	.00+-	.00	SB
56	BA			<	.00000	<	.05538	.00000+-	.00592	.00+-	.00	BA
57	LA			<	.00000	<	.09993	.01699+-	.01017	.00+-	.00	LA
80	HG			<	.00000	<	.00124	.00012+-	.00024	.00+-	.00	HG
82	PB		*	.04280+-	.00550	.13241+-	.02161	.04717+-	.00657	1.10+-	.21	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.1+- 1.4 COARSE: 32.3+- 3.3 TOTAL: 45.4+- 3.5

RESULTS FOR SMS SITE: MI 657 656 YEAR: 86 DATE: 1224
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9821
CHI SQUARE: .9652
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.068+-	.671	11.158+-	1.713
7	GYPSU	2.102+-	.412	4.629+-	.977
13	KNECT	24.238+-	3.246	53.367+-	8.262
22	2NCD3	.644+-	.058	1.418+-	.169
28	DUSTO	8.597+-	1.771	18.928+-	4.167
	TOTAL:	40.649+-	2.151	89.501+-	8.414

	SPECIES	INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			45.41740+-	3.52960	100.00000+-	10.99052	40.64881+-	2.15065	.90+-	.08	TOTAL
13	AL	*		1.40800+-	.15783	3.10013+-	.42286	1.87796+-	.13067	1.33+-	.18	AL
14	SI	*		6.43200+-	.62838	14.16197+-	1.76792	6.29093+-	.42024	.98+-	.12	SI
15	P			<	.00000	<	.02013	.01432+-	.00453	.00+-	.00	P
16	S.	*		1.82490+-	.16302	4.01806+-	.47576	1.83277+-	.06718	1.00+-	.10	S
17	CL			.01870+-	.00871	.04117+-	.01944	.04809+-	.00551	2.57+-	1.23	CL
19	K	*		.59320+-	.05389	1.30611+-	.15614	.49643+-	.03058	.84+-	.09	K
20	CA	*		4.00350+-	.43143	8.81490+-	1.17117	3.67612+-	.30981	.92+-	.13	CA
22	TI	*		.12410+-	.02515	.27324+-	.05931	.13977+-	.00893	1.13+-	.24	TI
23	V			.00720+-	.00691	.01585+-	.01527	.00587+-	.00097	.82+-	.79	V
24	CR			<	.00040	<	.00148	.00394+-	.00040	9.85+-	16.55	CR
25	MN	*		.02930+-	.00306	.06451+-	.00840	.02608+-	.00197	.89+-	.11	MN
26	FE	*		1.34800+-	.13802	2.96803+-	.38152	1.22726+-	.08393	.91+-	.11	FE
28	NI			.00100+-	.00050	.00220+-	.00111	.00323+-	.00074	3.23+-	1.77	NI
29	CU			.45590+-	.04492	1.00380+-	.12596	.22801+-	.01647	.50+-	.06	CU
30	ZN	*		.04900+-	.00460	.10789+-	.01314	.04922+-	.00380	1.00+-	.12	ZN
31	GA			.00110+-	.00081	.00242+-	.00179	.00089+-	.00050	.81+-	.75	GA
33	AS	*		.03820+-	.01001	.08411+-	.02299	.04933+-	.01006	1.29+-	.43	AS
34	SE			.00670+-	.00095	.01475+-	.00238	.00029+-	.00108	.04+-	.16	SE
35	BR	*		.00430+-	.00126	.00947+-	.00288	.00071+-	.00414	.16+-	.96	BR
37	RB			.00110+-	.00064	.00242+-	.00142	.00305+-	.00023	2.77+-	1.63	RB
38	SR			.00910+-	.00130	.02004+-	.00326	.00971+-	.00081	1.07+-	.18	SR
39	Y			<	.00000	<	.00234	.00244+-	.00057	.00+-	.00	Y
40	ZR			<	.00000	<	.00996	.00196+-	.00107	.00+-	.00	ZR
42	MO			<	.00170	<	.00530	.00198+-	.00063	1.16+-	1.68	MO
46	PD			<	.00000	<	.00576	.00000+-	.00062	.00+-	.00	PD
47	AG			<	.00000	<	.00716	.00029+-	.00078	.00+-	.00	AG
48	CD			<	.00000	<	.01015	.00517+-	.00119	.00+-	.00	CD
49	IN			<	.00000	<	.01183	.00133+-	.00121	.00+-	.00	IN
50	SN			<	.00000	<	.01386	.00399+-	.00149	.00+-	.00	SN
51	SB			<	.00000	<	.03099	.01339+-	.00345	.00+-	.00	SB
56	BA			<	.00000	<	.05732	.00000+-	.00626	.00+-	.00	BA
57	LA			<	.00000	<	.10406	.01699+-	.01094	.00+-	.00	LA
80	HG			<	.00000	<	.00125	.00012+-	.00029	.00+-	.00	HG
82	PB	*		.19630+-	.01825	.43221+-	.05237	.16600+-	.01356	.85+-	.10	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.1+- 1.4 COARSE: 32.3+- 3.3 TOTAL: 45.4+- 3.5

RESULTS FOR CMB SITE: GR 689 688 YEAR: 86 DATE: 1224
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9284
CHI SQUARE: 4.0770
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.080+-	.657	37.932+-	6.303
10	TRANS	1.507+-	.517	11.255+-	4.037
22	2NCD3	.256+-	.052	1.912+-	.435
28	DUSTO	3.367+-	.225	25.142+-	3.117
	TOTAL:	10.211+-	.775	76.241+-	9.844

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			13.39360+-	1.39890	100.00000+-	14.77081	10.21145+-	.77504	.76+-	.10	TOTAL
13	AL	*		.22740+-	.03140	1.69783+-	.29395	.34735+-	.03395	1.53+-	.26	AL
14	SI	*		1.40830+-	.16040	10.51472+-	1.62490	1.26094+-	.12550	.90+-	.14	SI
15	P			<	.00000	<	.04405	.00246+-	.00257	.00+-	.00	P
16	S	*		1.30450+-	.14780	9.73973+-	1.50086	1.30450+-	.05208	1.00+-	.12	S
17	CL			<	.00230	<	.03365	.02248+-	.00582	9.77+-	19.29	CL
19	K	*		.18060+-	.02060	1.34841+-	.20854	.10447+-	.01030	.58+-	.09	K
20	CA	*		.07400+-	.00860	.55250+-	.08633	.05912+-	.00541	.80+-	.12	CA
22	TI	*		.01750+-	.00220	.13066+-	.02136	.02068+-	.00206	1.18+-	.19	TI
23	V			.00050+-	.00040	.00373+-	.00301	.00034+-	.00028	.68+-	.78	V
24	CR			.00060+-	.00030	.00448+-	.00229	.00012+-	.00011	.20+-	.20	CR
25	MN	*		.00530+-	.00080	.03957+-	.00726	.00306+-	.00030	.58+-	.10	MN
26	FE	*		.14930+-	.01690	1.11471+-	.17169	.17788+-	.01720	1.19+-	.18	FE
28	NI			.00060+-	.00030	.00448+-	.00229	.00061+-	.00038	1.02+-	.81	NI
29	CU			.06110+-	.00690	.45619+-	.07017	.02633+-	.00246	.43+-	.06	CU
30	ZN	*		.02210+-	.00260	.16500+-	.02596	.02557+-	.00269	1.16+-	.18	ZN
31	GA			.00050+-	.00050	.00373+-	.00375	.00009+-	.00022	.18+-	.47	GA
33	AS	*		.02050+-	.00730	.15306+-	.05680	.01986+-	.00372	.97+-	.39	AS
34	SE			.00400+-	.00060	.02987+-	.00546	.00002+-	.00041	.00+-	.10	SE
35	BR	*		.00570+-	.00110	.04256+-	.00934	.00871+-	.00332	1.53+-	.65	BR
37	RB			<	.00000	<	.00373	.00035+-	.00008	.00+-	.00	RB
38	SR			<	.00000	<	.00373	.00066+-	.00011	.00+-	.00	SR
39	Y			.00090+-	.00080	.00672+-	.00601	.00048+-	.00023	.53+-	.54	Y
40	ZR			<	.00000	<	.02165	.00004+-	.00046	.00+-	.00	ZR
42	MO			<	.00000	<	.01269	.00008+-	.00026	.00+-	.00	MO
46	PD			<	.00000	<	.01269	.00000+-	.00028	.00+-	.00	PD
47	AG			<	.00000	<	.01717	.00014+-	.00031	.00+-	.00	AG
48	CD			.01400+-	.00360	.10453+-	.02901	.00250+-	.00054	.18+-	.06	CD
49	IN			<	.00000	<	.02763	.00010+-	.00059	.00+-	.00	IN
50	SN			<	.00000	<	.03285	.00088+-	.00070	.00+-	.00	SN
51	SB			<	.00000	<	.07317	.00310+-	.00163	.00+-	.00	SB
56	BA			<	.00000	<	.13887	.00119+-	.00282	.00+-	.00	BA
57	LA			<	.00000	<	.25311	.00000+-	.00537	.00+-	.00	LA
80	HG			<	.00000	<	.00224	.00000+-	.00010	.00+-	.00	HG
82	PB	*		.12170+-	.01380	.90864+-	.14008	.10091+-	.01172	.83+-	.13	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.4+- 1.4 COARSE: 29.6+- 3.0 TOTAL: 43.0+- 3.3

RESULTS FOR CME SITE: GR 685 685 YEAR: 86 DATE: 1224
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9766
CHI SQUARE: 1.2184
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.572+-	.327	5.307+-	1.226
10	TRANS	.000+-	.000	.000+-	.000
22	2NCD3	.135+-	.044	.457+-	.157
27	COMPR	.426+-	.289	1.438+-	.987
28	DUSTO	28.224+-	1.893	95.280+-	11.536
	TOTAL:	30.357+-	1.797	102.481+-	11.979

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			29.62200+-	2.98570	100.00000+-	14.25433	30.35685+-	1.79716	1.02+-	.12	TOTAL
13	AL	*		1.78270+-	.22730	6.01816+-	.97814	1.91210+-	.19050	1.07+-	.17	AL
14	SI	*		8.53510+-	.95640	28.81338+-	4.34267	7.31501+-	.72817	.86+-	.13	SI
15	P			<	.00000	<	.03140	.00015+-	.00704	.00+-	.00	P
16	S	*		.52350+-	.06410	1.76727+-	.28028	.57204+-	.04225	1.09+-	.16	S
17	CL			.01190+-	.00590	.04017+-	.02033	.00000+-	.00331	.00+-	.28	CL
19	K	*		.90270+-	.10160	3.04740+-	.46042	1.00106+-	.09980	1.11+-	.17	K
20	CA	*		.81750+-	.09180	2.75977+-	.41643	.74416+-	.05196	.91+-	.12	CA
22	TI	*		.19530+-	.04400	.65931+-	.16273	.28262+-	.02820	1.45+-	.36	TI
23	V			<	.00950	<	.03257	.00411+-	.00237	.43+-	.50	V
24	CR			<	.00000	<	.00236	.00149+-	.00054	.00+-	.00	CR
25	MN	*		.03300+-	.00380	.11140+-	.01705	.02394+-	.00237	.73+-	.11	MN
26	FE	*		1.63330+-	.18310	5.51381+-	.83123	1.67115+-	.16165	1.02+-	.15	FE
28	NI			.00110+-	.00050	.00371+-	.00173	.00342+-	.00305	3.11+-	3.11	NI
29	CU			.44690+-	.05020	1.50868+-	.22769	.30844+-	.02442	.69+-	.09	CU
30	ZN	*		.02490+-	.00370	.08406+-	.01509	.02434+-	.00204	.98+-	.17	ZN
31	GA			<	.00000	<	.00135	.00000+-	.00028	.00+-	.00	GA
33	AS	*		.01070+-	.00350	.03612+-	.01236	.01212+-	.00566	1.13+-	.65	AS
34	SE			<	.00090	<	.00440	.00000+-	.00060	.00+-	.67	SE
35	BR	*		.00180+-	.00040	.00608+-	.00148	.00071+-	.00244	.39+-	1.36	BR
37	RB			.00340+-	.00060	.01148+-	.00233	.00547+-	.00054	1.61+-	.33	RB
38	SR			.00430+-	.00070	.01452+-	.00278	.00586+-	.00059	1.36+-	.26	SR
39	Y			<	.00000	<	.00203	.00133+-	.00043	.00+-	.00	Y
40	ZR			<	.00000	<	.01013	.00000+-	.00128	.00+-	.00	ZR
42	MO			.01260+-	.00220	.04254+-	.00858	.00887+-	.00096	.70+-	.14	MO
46	PD			<	.00000	<	.00540	.00000+-	.00073	.00+-	.00	PD
47	AG			<	.00000	<	.00743	.00005+-	.00099	.00+-	.00	AG
48	CD			<	.00000	<	.00945	.00113+-	.00132	.00+-	.00	CD
49	IN			<	.00000	<	.01215	.00000+-	.00158	.00+-	.00	IN
50	SN			<	.00000	<	.01418	.00057+-	.00179	.00+-	.00	SN
51	SB			<	.00000	<	.03140	.00225+-	.00414	.00+-	.00	SB
56	BA			<	.00000	<	.06009	.00000+-	.00785	.00+-	.00	BA
57	LA			<	.00000	<	.10533	.00000+-	.01344	.00+-	.00	LA
80	HG			<	.00000	<	.00135	.00000+-	.00024	.00+-	.00	HG
82	PB	*		.04140+-	.00520	.13976+-	.02251	.04125+-	.00505	1.00+-	.17	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.4+- 1.4 COARSE: 29.6+- 3.0 TOTAL: 43.0+- 3.3

RESULTS FOR CMB SITE: GR 689 688 YEAR: 86 DATE: 1224
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9766
CHI SQUARE: 1.2184
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.080+-	.657	11.811+-	1.775
7	GYPSU	1.572+-	.327	3.654+-	.810
10	TRANS	1.507+-	.517	3.505+-	1.232
22	2NCO3	.391+-	.068	.910+-	.173
27	COMPR	.426+-	.289	.990+-	.676
28	DUSTO	31.591+-	1.907	73.441+-	7.165
	TOTAL:	40.568+-	1.957	94.311+-	8.542

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			43.01560+-	3.29717	100.00000+-	10.84002	40.56830+-	1.95716	.94+-	.09	TOTAL
13	AL		*	2.01010+-	.22946	4.67296+-	.64253	2.25945+-	.19350	1.12+-	.16	AL
14	SI		*	9.94340+-	.96976	23.11580+-	2.86738	8.57595+-	.73891	.86+-	.11	SI
15	P			<	.00000	<	.02560	.00261+-	.00749	.00+-	.00	P
16	S		*	1.82800+-	.16110	4.24962+-	.49635	1.87654+-	.06706	1.03+-	.10	S
17	CL			.01420+-	.00742	.03301+-	.01743	.02248+-	.00670	1.58+-	.95	CL
19	K		*	1.08330+-	.10367	2.51839+-	.30878	1.10553+-	.10033	1.02+-	.13	K
20	CA		*	.89150+-	.09220	2.07250+-	.26680	.80328+-	.05224	.90+-	.11	CA
22	TI		*	.21280+-	.04405	.49470+-	.10921	.30330+-	.02827	1.43+-	.32	TI
23	V			.01000+-	.00961	.02325+-	.02241	.00445+-	.00239	.45+-	.49	V
24	CR			<	.00060	<	.00177	.00162+-	.00055	2.69+-	3.54	CR
25	MN		*	.03830+-	.00388	.08904+-	.01132	.02701+-	.00239	.71+-	.09	MN
26	FE		*	1.78260+-	.18388	4.14408+-	.53257	1.84903+-	.16256	1.04+-	.14	FE
28	NI			.00170+-	.00058	.00395+-	.00139	.00403+-	.00307	2.37+-	1.98	NI
29	CU			.50800+-	.05067	1.18097+-	.14856	.33476+-	.02454	.66+-	.08	CU
30	ZN		*	.04700+-	.00452	.10926+-	.01344	.04991+-	.00338	1.06+-	.12	ZN
31	GA			<	.00050	<	.00149	.00009+-	.00035	.18+-	.74	GA
33	AS		*	.03120+-	.00810	.07253+-	.01962	.03198+-	.00677	1.02+-	.34	AS
34	SE			.00490+-	.00143	.01139+-	.00344	.00002+-	.00073	.00+-	.15	SE
35	BR		*	.00750+-	.00117	.01744+-	.00303	.00942+-	.00412	1.26+-	.58	BR
37	RB			.00340+-	.00078	.00790+-	.00191	.00582+-	.00055	1.71+-	.42	RB
38	SR			.00430+-	.00086	.01000+-	.00214	.00653+-	.00060	1.52+-	.33	SR
39	Y			<	.00090	<	.00233	.00181+-	.00049	2.01+-	2.30	Y
40	ZR			<	.00000	<	.00970	.00004+-	.00136	.00+-	.00	ZR
42	MO			.01260+-	.00278	.02929+-	.00684	.00895+-	.00100	.71+-	.18	MO
46	PD			<	.00000	<	.00543	.00000+-	.00078	.00+-	.00	PD
47	AG			<	.00000	<	.00740	.00019+-	.00104	.00+-	.00	AG
48	CD			.01400+-	.00456	.03255+-	.01089	.00362+-	.00142	.26+-	.13	CD
49	IN			<	.00000	<	.01200	.00010+-	.00169	.00+-	.00	IN
50	SN			<	.00000	<	.01414	.00144+-	.00192	.00+-	.00	SN
51	SB			<	.00000	<	.03141	.00534+-	.00445	.00+-	.00	SB
56	BA			<	.00000	<	.05985	.00119+-	.00834	.00+-	.00	BA
57	LA			<	.00000	<	.10711	.00000+-	.01447	.00+-	.00	LA
80	HG			<	.00000	<	.00116	.00000+-	.00026	.00+-	.00	HG
82	PB		*	.16310+-	.01475	.37916+-	.04494	.14216+-	.01276	.87+-	.11	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.4+- 1.4 COARSE: 29.6+- 3.0 TOTAL: 43.0+- 3.3

RESULTS FOR THE SITE: GR 70' 70' YEAR. 86 DATE: 1228
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9309
CHI SQUARE: 4.2434
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.168+-	.657	46.630+-	7.745
7	GYPSU	.225+-	.053	2.027+-	.522
17	MTFF1	.861+-	.077	7.764+-	1.083
28	DUSTO	2.119+-	.152	19.117+-	2.458
	TOTAL:	8.372+-	.675	75.538+-	10.110

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			11.08330+-	1.18410	100.00000+-	15.10895	8.37207+-	.67490	.76+-	.10	TOTAL
13	AL		*	.15030+-	.02200	1.35609+-	.24575	.21310+-	.02140	1.42+-	.25	AL
14	SI		*	.77750+-	.08920	7.01506+-	1.09974	.78951+-	.07897	1.02+-	.15	SI
15	P			<	.02750	<	.25043	.00081+-	.00111	.03+-	.05	P
16	S		*	1.30430+-	.14830	11.76816+-	1.83605	1.30430+-	.05291	1.00+-	.12	S
17	CL			<	.00000	<	.04241	.00000+-	.00163	.00+-	.00	CL
19	K		*	.10280+-	.01200	.92752+-	.14677	.06765+-	.00649	.66+-	.10	K
20	CA		*	.08210+-	.00950	.74075+-	.11666	.08210+-	.00744	1.00+-	.15	CA
22	TI		*	.01310+-	.00170	.11820+-	.01987	.01293+-	.00130	.99+-	.16	TI
23	V			.00090+-	.00040	.00812+-	.00371	.00018+-	.00019	.20+-	.23	V
24	CR			<	.00010	<	.00271	.00023+-	.00006	2.30+-	6.93	CR
25	MN		*	.00320+-	.00060	.02887+-	.00623	.00188+-	.00018	.59+-	.12	MN
26	FE		*	.11880+-	.01350	1.07188+-	.16718	.12842+-	.01078	1.08+-	.15	FE
28	NI			.00030+-	.00030	.00271+-	.00272	.00023+-	.00024	.78+-	1.10	NI
29	CU			.10420+-	.01180	.94015+-	.14637	.04361+-	.00324	.42+-	.06	CU
30	ZN		*	.06460+-	.00740	.58286+-	.09130	.08472+-	.00840	1.31+-	.20	ZN
31	GA			<	.00050	<	.00543	.00000+-	.00075	.00+-	1.49	GA
33	AS		*	.37980+-	.04340	3.42678+-	.53607	.28229+-	.02821	.74+-	.11	AS
34	SE			.00500+-	.00070	.04511+-	.00794	.00000+-	.00084	.00+-	.17	SE
35	BR		*	<	.00040	<	.06767	.02179+-	.00218	54.47+-	1021.41	BR
37	RB			<	.00000	<	.00541	.00022+-	.00028	.00+-	.00	RB
38	SR			<	.00000	<	.00541	.00036+-	.00007	.00+-	.00	SR
39	Y			<	.00020	<	.00812	.00017+-	.00092	.87+-	6.04	Y
40	ZR			<	.00000	<	.02977	.00000+-	.00066	.00+-	.00	ZR
42	MO			<	.00000	<	.01805	.00138+-	.00021	.00+-	.00	MO
46	PD			<	.00000	<	.01895	.00000+-	.00017	.00+-	.00	PD
47	AG			<	.00000	<	.02436	.00021+-	.00020	.00+-	.00	AG
48	CD			.01040+-	.00390	.09383+-	.03659	.01445+-	.00148	1.39+-	.54	CD
49	IN			<	.00000	<	.03880	.00026+-	.00037	.00+-	.00	IN
50	SN			<	.00000	<	.04692	.00364+-	.00057	.00+-	.00	SN
51	SB			<	.00000	<	.10917	.01713+-	.00217	.00+-	.00	SB
56	BA			<	.00000	<	.19218	.00000+-	.00171	.00+-	.00	BA
57	LA			<	.00000	<	.35008	.00000+-	.00338	.00+-	.00	LA
80	HG			.00080+-	.00050	.00722+-	.00458	.00000+-	.00168	.00+-	2.10	HG
82	PB		*	.14740+-	.01670	1.32993+-	.20710	.10747+-	.01073	.73+-	.11	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.1+- 1.2 COARSE: 98.6+- 9.9 TOTAL: 109.7+- 9.9

RESULTS FOR CMB SITE: GR 701 700 YEAR: 86 DATE: 1228
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9629
CHI SQUARE: 1.7186
DF: 9

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	2.145+-	.706	2.176+-	.748
16	SSFF1	.422+-	.065	.429+-	.079
17	MTFF1	.000+-	.000	.000+-	.000
28	DUSTO	88.847+-	5.833	90.124+-	10.788
	TOTAL:	91.415+-	5.575	92.729+-	10.868

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			98.58330+-	9.86710	100.00000+-	14.15472	91.41482+-	5.57458	.93+-	.11	TOTAL
13	AL	*		5.19910+-	.64680	5.27381+-	.84207	5.99666+-	.59965	1.15+-	.18	AL
14	SI	*		22.46610+-	2.51350	22.78895+-	3.42099	22.93869+-	2.29217	1.02+-	.15	SI
15	P			<	.00100	<	.02130	.00000+-	.02176	.00+-	21.76	P
16	S	*		1.05550+-	.12330	1.07067+-	.16470	1.15890+-	.08716	1.10+-	.15	S
17	CL			<	.00560	<	.00935	.00000+-	.00963	.00+-	1.72	CL
19	K	*		3.39160+-	.37990	3.44034+-	.51679	3.14306+-	.31416	.93+-	.14	K
20	CA	*		1.87740+-	.21100	1.90438+-	.28660	1.65819+-	.12641	.88+-	.12	CA
22	TI	*		.68380+-	.15310	.69363+-	.17011	.88793+-	.08876	1.30+-	.32	TI
23	V			<	.03660	<	.03761	.01418+-	.00746	.39+-	.44	V
24	CR			<	.00000	<	.00162	.00516+-	.00169	.00+-	.00	CR
25	MN	*		.10370+-	.01170	.10519+-	.01587	.07496+-	.00746	.72+-	.11	MN
26	FE	*		5.17780+-	.58000	5.25221+-	.78898	5.11271+-	.50857	.99+-	.15	FE
28	NI			.00430+-	.00120	.00436+-	.00129	.01035+-	.00951	2.41+-	2.31	NI
29	CU			1.33970+-	.15020	1.35895+-	.20424	.75904+-	.07326	.57+-	.08	CU
30	ZN	*		.05300+-	.00900	.05376+-	.01060	.07249+-	.01014	1.37+-	.30	ZN
31	GA			<	.00000	<	.00061	.00000+-	.00096	.00+-	.00	GA
33	AS	*		.08630+-	.01170	.08754+-	.01475	.04935+-	.01113	.57+-	.15	AS
34	SE			.00180+-	.00040	.00183+-	.00045	.00000+-	.00103	.00+-	.57	SE
35	BR	*		<	.00000	<	.00112	.00222+-	.01047	.00+-	.00	BR
37	RB			.01810+-	.00210	.01836+-	.00281	.01706+-	.00169	.94+-	.14	RB
38	SR			.01520+-	.00190	.01542+-	.00247	.01839+-	.00187	1.21+-	.19	SR
39	Y			.00360+-	.00110	.00365+-	.00117	.00418+-	.00120	1.16+-	.49	Y
40	ZR			<	.00000	<	.00436	.00000+-	.00404	.00+-	.00	ZR
42	MO			.05430+-	.00660	.05508+-	.00867	.02644+-	.00303	.49+-	.08	MO
46	PD			<	.00000	<	.00213	.00000+-	.00231	.00+-	.00	PD
47	AG			<	.00000	<	.00294	.00000+-	.00311	.00+-	.00	AG
48	CD			<	.00000	<	.00385	.00484+-	.00433	.00+-	.00	CD
49	IN			<	.00000	<	.00456	.00000+-	.00498	.00+-	.00	IN
50	SN			<	.00000	<	.00558	.00108+-	.00562	.00+-	.00	SN
51	SB			<	.00000	<	.01177	.00432+-	.01296	.00+-	.00	SB
56	BA			<	.00000	<	.02303	.00000+-	.02470	.00+-	.00	BA
57	LA			<	.00000	<	.04078	.00000+-	.04229	.00+-	.00	LA
80	HG			<	.00310	<	.00326	.00000+-	.00115	.00+-	.37	HG
82	PB		*	.05170+-	.00650	.05244+-	.00843	.05564+-	.00822	1.08+-	.21	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.1+- 1.2 COARSE: 98.6+- 9.9 TOTAL: 109.7+- 9.9

RESULTS FOR THE SITE OF [illegible] YEAR: 86 DATE: [illegible]
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9629
CHI SQUARE: 1.7186
DF: 9

#	TYPE	UG/M3		%	
5	5095	5.168+-	.657	4.713+-	.736
7	GYPSU	2.370+-	.708	2.161+-	.674
16	SSFF1	.422+-	.065	.385+-	.069
17	MTFF1	.861+-	.077	.785+-	.100
28	DUSTO	90.966+-	5.835	82.948+-	9.209
	TOTAL:	99.787+-	5.615	90.991+-	9.706

	SPECIES	INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			109.66660+-	9.93789	100.00000+-	12.81548	99.78689+-	5.61528	.91+-	.10	TOTAL
13	AL	*		5.34940+-	.64717	4.87788+-	.73732	6.20976+-	.60003	1.16+-	.18	AL
14	SI	*		23.24360+-	2.51508	21.19479+-	2.99141	23.72820+-	2.29353	1.02+-	.15	SI
15	P			<	.02850	<	.03171	.00081+-	.02179	.03+-	.77	P
16	S	*		2.35980+-	.19286	2.15179+-	.26258	2.46320+-	.10196	1.04+-	.10	S
17	CL			<	.00560	<	.00943	.00000+-	.00976	.00+-	1.74	CL
19	K	*		3.49440+-	.38009	3.18638+-	.45111	3.21071+-	.31423	.92+-	.13	K
20	CA	*		1.95950+-	.21121	1.78678+-	.25162	1.74029+-	.12663	.89+-	.12	CA
22	TI	*		.69690+-	.15311	.63547+-	.15102	.90086+-	.08877	1.29+-	.31	TI
23	V			.03750+-	.03690	.03419+-	.03379	.01436+-	.00747	.38+-	.43	V
24	CR			<	.00010	<	.00148	.00539+-	.00169	53.92+-	877.88	CR
25	MN	*		.10690+-	.01172	.09748+-	.01386	.07684+-	.00747	.72+-	.11	MN
26	FE	*		5.29660+-	.58016	4.82973+-	.68659	5.24113+-	.50868	.99+-	.14	FE
28	NI			.00460+-	.00124	.00419+-	.00119	.01058+-	.00951	2.30+-	2.16	NI
29	CU			1.44390+-	.15066	1.31663+-	.18196	.80265+-	.07333	.56+-	.08	CU
30	ZN	*		.11760+-	.01165	.10723+-	.01440	.15721+-	.01317	1.34+-	.17	ZN
31	GA			<	.00050	<	.00077	.00000+-	.00122	.00+-	2.43	GA
33	AS	*		.46610+-	.04495	.42502+-	.05624	.33164+-	.03033	.71+-	.09	AS
34	SE			.00680+-	.00081	.00620+-	.00093	.00000+-	.00133	.00+-	.20	SE
35	BR	*		<	.00040	<	.00691	.02401+-	.01069	60.03+-	1137.87	BR
37	RB			.01810+-	.00218	.01650+-	.00249	.01728+-	.00172	.95+-	.15	RB
38	SR			.01520+-	.00199	.01386+-	.00221	.01875+-	.00187	1.23+-	.20	SR
39	Y			.00380+-	.00142	.00347+-	.00133	.00435+-	.00151	1.14+-	.58	Y
40	ZR			<	.00000	<	.00494	.00000+-	.00409	.00+-	.00	ZR
42	MO			.05430+-	.00690	.04951+-	.00773	.02782+-	.00304	.51+-	.09	MO
46	PD			<	.00000	<	.00271	.00000+-	.00232	.00+-	.00	PD
47	AG			<	.00000	<	.00361	.00021+-	.00312	.00+-	.00	AG
48	CD			.01040+-	.00545	.00948+-	.00504	.01929+-	.00458	1.85+-	1.07	CD
49	IN			<	.00000	<	.00568	.00026+-	.00499	.00+-	.00	IN
50	SN			<	.00000	<	.00690	.00472+-	.00565	.00+-	.00	SN
51	SB			<	.00000	<	.01528	.02145+-	.01314	.00+-	.00	SB
56	BA			<	.00000	<	.02838	.00000+-	.02476	.00+-	.00	BA
57	LA			<	.00000	<	.05095	.00000+-	.04243	.00+-	.00	LA
80	HG			.00390+-	.00324	.00356+-	.00297	.00000+-	.00204	.00+-	.52	HG
82	PB	*		.19910+-	.01792	.18155+-	.02319	.16312+-	.01351	.82+-	.10	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.1+- 1.2 COARSE: 98.6+- 9.9 TOTAL: 109.7+- 9.9

RESULTS FOR CMB SITE: GR 703 702 YEAR: 86 DATE: 1229
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9603
CHI SQUARE: 2.4375
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.021+-	.674	35.072+-	5.961
7	GYPSU	.377+-	.094	2.633+-	.711
28	DUSTO	5.049+-	.329	35.268+-	4.335
33	CONCO	1.097+-	.105	7.666+-	1.087
	TOTAL:	11.544+-	.746	80.639+-	9.889

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			14.31560+-	1.49210	100.00000+-	14.74020	11.54397+-	.74588	.81+-	.10	TOTAL
13	AL	*		.41820+-	.05300	2.92129+-	.47935	.50780+-	.05078	1.21+-	.20	AL
14	SI	*		1.43580+-	.16420	10.02962+-	1.55191	1.88132+-	.18815	1.31+-	.20	SI
15	P			<	.00000	<	.04820	.00193+-	.00215	.00+-	.00	P
16	S	*		1.32790+-	.15180	9.27590+-	1.43497	1.32790+-	.05321	1.00+-	.12	S
17	CL			.18420+-	.02220	1.28671+-	.20502	.00000+-	.00252	.00+-	.01	CL
19	K	*		.15120+-	.01740	1.05619+-	.16399	.15588+-	.01544	1.03+-	.16	K
20	CA	*		.15870+-	.01810	1.10858+-	.17128	.15870+-	.01140	1.00+-	.13	CA
22	TI	*		.03610+-	.00420	.25217+-	.03939	.03080+-	.00308	.85+-	.13	TI
23	V			.00120+-	.00060	.00838+-	.00428	.00044+-	.00042	.37+-	.39	V
24	CR			.00150+-	.00040	.01048+-	.00300	.00018+-	.00014	.12+-	.10	CR
25	MN	*		.00750+-	.00100	.05239+-	.00887	.00421+-	.00042	.56+-	.09	MN
26	FE	*		.29120+-	.03280	2.03414+-	.31217	.25133+-	.02509	.86+-	.13	FE
28	NI			.00090+-	.00050	.00629+-	.00355	.00063+-	.00056	.70+-	.73	NI
29	CU			.22910+-	.02580	1.60035+-	.24557	.04063+-	.00356	.18+-	.03	CU
30	ZN	*		.08870+-	.01010	.61960+-	.09565	.08119+-	.00796	.92+-	.14	ZN
31	GA			.00140+-	.00090	.00978+-	.00637	.00027+-	.00039	.19+-	.30	GA
33	AS	*		.10380+-	.01680	.72508+-	.13958	.07975+-	.00912	.77+-	.15	AS
34	SE			.02310+-	.00270	.16136+-	.02527	.00000+-	.00064	.00+-	.03	SE
35	BR	*		.00230+-	.00200	.01607+-	.01407	.00000+-	.00394	.00+-	1.71	BR
37	RB			<	.00000	<	.00349	.00052+-	.00013	.00+-	.00	RB
38	SR			<	.00000	<	.00419	.00086+-	.00014	.00+-	.00	SR
39	Y			<	.00000	<	.00699	.00082+-	.00052	.00+-	.00	Y
40	ZR			<	.00000	<	.02445	.00015+-	.00070	.00+-	.00	ZR
42	MO			<	.00000	<	.01327	.00054+-	.00039	.00+-	.00	MO
46	PD			<	.00000	<	.01327	.00000+-	.00041	.00+-	.00	PD
47	AG			<	.00000	<	.01886	.00055+-	.00047	.00+-	.00	AG
48	CD			<	.00000	<	.02585	.00692+-	.00098	.00+-	.00	CD
49	IN			<	.00000	<	.03004	.00040+-	.00088	.00+-	.00	IN
50	SN			<	.00000	<	.03563	.00334+-	.00109	.00+-	.00	SN
51	SB			<	.00000	<	.07754	.01214+-	.00248	.00+-	.00	SB
56	BA			<	.00000	<	.14390	.00000+-	.00408	.00+-	.00	BA
57	LA			<	.00000	<	.26475	.00000+-	.00806	.00+-	.00	LA
80	HG			.00080+-	.00050	.00559+-	.00354	.00000+-	.00029	.00+-	.36	HG
82	PB	*		.21650+-	.02440	1.51234+-	.23216	.25906+-	.02586	1.20+-	.18	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 14.3+- 1.5 COARSE: 221.3+-22.1 TOTAL: 235.7+-22.2

RESULTS FOR CME SITE, GR 703 702 YEAR: 86 DATE: 1229
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9028
CHI SQUARE: 4.6403
DF: 9

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
6	CAO	3.866+-	.969	1.747+-	.471
7	GYPSU	.000+-	.000	.000+-	.000
27	COMPR	2.779+-	.477	1.255+-	.249
28	DUSTO	174.284+-	11.344	78.738+-	9.399
33	CONCO	.000+-	.000	.000+-	.000
	TOTAL:	180.930+-	11.082	81.740+-	9.590

COARSE SUSPENDED PARTICULATE

SPECIES		INCL	MISS FLG	MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			221.34780+-	22.14800	100.00000+-	14.15058	180.92980+-	11.08203	.82+-	.10	TOTAL
13	AL		*	8.02150+-	1.00950	3.62393+-	.58265	11.80990+-	1.17625	1.47+-	.24	AL
14	SI		*	34.90790+-	3.90720	15.77061+-	2.36769	45.18255+-	4.49642	1.29+-	.19	SI
15	P			<	.02560	<	.01928	.00096+-	.04254	.04+-	1.66	P
16	S		*	1.84010+-	.21230	.83132+-	.12696	1.74033+-	.15109	.95+-	.14	S
17	CL			<	.00570	<	.00881	.00000+-	.01833	.00+-	3.22	CL
19	K		*	6.03450+-	.67580	2.72625+-	.40942	6.18257+-	.61627	1.02+-	.15	K
20	CA		*	5.08220+-	.56980	2.29602+-	.34503	5.08220+-	.35644	1.00+-	.13	CA
22	TI		*	2.18180+-	.48860	.98569+-	.24177	1.74545+-	.17411	.80+-	.20	TI
23	V			<	.09910	<	.04526	.02541+-	.01464	.26+-	.30	V
24	CR			<	.00000	<	.00199	.00924+-	.00331	.00+-	.00	CR
25	MN		*	.34940+-	.03920	.15785+-	.02373	.14789+-	.01464	.42+-	.06	MN
26	FE		*	16.05260+-	1.79810	7.25221+-	1.08925	10.33628+-	.99826	.64+-	.10	FE
28	NI			.01000+-	.00240	.00452+-	.00117	.02124+-	.01883	2.12+-	1.95	NI
29	CU			2.46730+-	.27680	1.11467+-	.16756	1.92194+-	.15159	.78+-	.11	CU
30	ZN		*	.10600+-	.01710	.04789+-	.00909	.10601+-	.00965	1.00+-	.19	ZN
31	GA			<	.00000	<	.00041	.00000+-	.00107	.00+-	.00	GA
33	AS		*	.01900+-	.00670	.00858+-	.00315	.01429+-	.00401	.75+-	.34	AS
34	SE			.00400+-	.00080	.00181+-	.00040	.00000+-	.00070	.00+-	.17	SE
35	BR		*	<	.00000	<	.00032	.00436+-	.00436	.00+-	.00	BR
37	RB			.04250+-	.00500	.01920+-	.00297	.03378+-	.00333	.79+-	.12	RB
38	SR			.03730+-	.00440	.01685+-	.00261	.03621+-	.00366	.97+-	.15	SR
39	Y			.00750+-	.00180	.00339+-	.00088	.00819+-	.00210	1.09+-	.38	Y
40	ZR			<	.00330	<	.00285	.00000+-	.00784	.00+-	2.38	ZR
42	MO			.06310+-	.00800	.02851+-	.00460	.05447+-	.00595	.86+-	.14	MO
46	PD			<	.00000	<	.00126	.00000+-	.00453	.00+-	.00	PD
47	AG			<	.00000	<	.00176	.00013+-	.00610	.00+-	.00	AG
48	CD			<	.00000	<	.00239	.00190+-	.00785	.00+-	.00	CD
49	IN			<	.00000	<	.00289	.00000+-	.00976	.00+-	.00	IN
50	SN			<	.00000	<	.00330	.00000+-	.01098	.00+-	.00	SN
51	SB			<	.00000	<	.00718	.00201+-	.02528	.00+-	.00	SB
56	BA			.05810+-	.03030	.02625+-	.01394	.00000+-	.04846	.00+-	.83	BA
57	LA			<	.00000	<	.02363	.00000+-	.08297	.00+-	.00	LA
80	HG			.00090+-	.00080	.00041+-	.00036	.00000+-	.00105	.00+-	1.16	HG
82	PB		*	.06400+-	.00880	.02891+-	.00492	.06776+-	.00644	1.06+-	.18	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 14.3+- 1.5 COARSE: 221.3+-22.1 TOTAL: 235.7+-22.2

RESULTS FOR CMB SITE: GR 703 702 YEAR: 86 DATE: 1229
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9028
CHI SQUARE: 4.6403
DF: 9

#	TYPE	UG/M3		%	
5	5095	5.021+-	.674	2.130+-	.349
6	CAD	3.866+-	.969	1.641+-	.439
7	GYPSU	.377+-	.094	.160+-	.043
27	COMPR	2.779+-	.477	1.179+-	.231
28	DUSTO	179.333+-	11.349	76.097+-	8.635
33	CONCO	1.097+-	.105	.466+-	.063
	TOTAL:	192.474+-	11.107	81.673+-	9.022

SPECIES		INCL	MISS FLG	TOTAL MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			235.66340+-	22.19820	100.00000+-	13.32112	192.47370+-	11.10710	.82+-	.09	TOTAL
13	AL	*		8.43970+-	1.01089	3.58125+-	.54571	12.31770+-	1.17735	1.46+-	.22	AL
14	SI	*		36.34370+-	3.91065	15.42187+-	2.20542	47.06387+-	4.50035	1.29+-	.19	SI
15	P			<	.02560	<	.01834	.00289+-	.04259	.11+-	1.67	P
16	S	*		3.16800+-	.26099	1.34429+-	.16822	3.06823+-	.16019	.97+-	.09	S
17	CL			.18990+-	.02955	.08058+-	.01466	.00000+-	.01850	.00+-	.10	CL
19	K	*		6.18570+-	.67602	2.62480+-	.37870	6.33845+-	.61647	1.02+-	.15	K
20	CA	*		5.24090+-	.57009	2.22389+-	.32000	5.24090+-	.35662	1.00+-	.13	CA
22	TI	*		2.21790+-	.48862	.94113+-	.22549	1.77625+-	.17414	.80+-	.19	TI
23	V			.10030+-	.09970	.04256+-	.04250	.02585+-	.01465	.26+-	.29	V
24	CR			<	.00150	<	.00188	.00943+-	.00332	6.28+-	18.64	CR
25	MN	*		.35690+-	.03921	.15144+-	.02192	.15210+-	.01465	.43+-	.06	MN
26	FE	*		16.34380+-	1.79840	6.93523+-	1.00454	10.58761+-	.99857	.65+-	.09	FE
28	NI			.01090+-	.00245	.00463+-	.00113	.02187+-	.01884	2.01+-	1.79	NI
29	CU			2.69640+-	.27800	1.14417+-	.15978	1.96256+-	.15163	.73+-	.09	CU
30	ZN	*		.19470+-	.01986	.08262+-	.01147	.18721+-	.01251	.96+-	.12	ZN
31	GA			.00140+-	.00127	.00059+-	.00054	.00027+-	.00113	.19+-	.83	GA
33	AS	*		.12280+-	.01809	.05211+-	.00911	.09403+-	.00997	.77+-	.14	AS
34	SE			.02710+-	.00282	.01150+-	.00161	.00000+-	.00095	.00+-	.04	SE
35	BR	*		.00230+-	.00212	.00098+-	.00090	.00436+-	.00587	1.89+-	3.09	BR
37	RB			.04250+-	.00502	.01803+-	.00273	.03430+-	.00333	.81+-	.12	RB
38	SR			.03730+-	.00444	.01583+-	.00240	.03707+-	.00366	.99+-	.15	SR
39	Y			.00750+-	.00206	.00318+-	.00092	.00901+-	.00216	1.20+-	.44	Y
40	ZR			<	.00330	<	.00306	.00015+-	.00788	.05+-	2.39	ZR
42	MO			.06310+-	.00822	.02678+-	.00431	.05502+-	.00597	.87+-	.15	MO
46	PD			<	.00000	<	.00144	.00000+-	.00455	.00+-	.00	PD
47	AG			<	.00000	<	.00201	.00069+-	.00612	.00+-	.00	AG
48	CD			<	.00000	<	.00274	.00882+-	.00791	.00+-	.00	CD
49	IN			<	.00000	<	.00327	.00040+-	.00980	.00+-	.00	IN
50	SN			<	.00000	<	.00378	.00334+-	.01104	.00+-	.00	SN
51	SB			<	.00000	<	.00823	.01415+-	.02540	.00+-	.00	SB
56	BA			.05810+-	.03664	.02465+-	.01572	.00000+-	.04863	.00+-	.84	BA
57	LA			<	.00000	<	.02741	.00000+-	.08336	.00+-	.00	LA
80	HG			.00170+-	.00094	.00072+-	.00041	.00000+-	.00109	.00+-	.64	HG
82	PB	*		.28050+-	.02594	.11903+-	.01571	.32682+-	.02665	1.17+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 14.3+- 1.5 COARSE: 221.3+-22.1 TOTAL: 235.7+-22.2

RESULTS FOR THE SITE: OR TEST TBE YEAR 87 DATE [illegible]
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9599
CHI SQUARE: 2.3562
DF: 8

#	TYPE	UG/M3		%	
5	5095	1.851+-	.403	1.440+-	.340
7	GYPSU	4.875+-	1.100	3.793+-	.925
19	SSFF2	.220+-	.146	.172+-	.115
21	2NCD2	.976+-	.126	.759+-	.121
27	COMPR	4.719+-	1.195	3.672+-	.990
28	DUSTO	106.038+-	6.824	82.508+-	9.302
	TOTAL:	118.679+-	6.517	92.344+-	9.939

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			128.51860+-	11.89700	100.00000+-	13.09141	118.67950+-	6.51719	.92+-	.10	TOTAL
13	AL	*		7.05670+-	.79634	5.49080+-	.80143	7.40881+-	.68483	1.05+-	.15	AL
14	SI	*		26.09160+-	2.73266	20.30181+-	2.83778	28.32437+-	2.61750	1.09+-	.15	SI
15	P			<	.01080	<	.02075	.00357+-	.02486	.33+-	2.44	P
16	S	*		2.41170+-	.21440	1.87654+-	.24085	2.68525+-	.12857	1.11+-	.11	S
17	CL			.05220+-	.01406	.04062+-	.01157	.00000+-	.01140	.00+-	.22	CL
19	K	*		2.98270+-	.31769	2.32083+-	.32751	3.76285+-	.35819	1.26+-	.18	K
20	CA	*		3.18000+-	.33469	2.47435+-	.34682	2.62885+-	.16750	.83+-	.10	CA
22	TI	*		.88410+-	.19054	.68792+-	.16136	1.04794+-	.10115	1.19+-	.28	TI
23	V			.03580+-	.03431	.02786+-	.02682	.01534+-	.00851	.43+-	.47	V
24	CR			<	.00000	<	.00166	.00597+-	.00194	.00+-	.00	CR
25	MN	*		.14600+-	.01602	.11360+-	.01631	.09125+-	.00851	.62+-	.09	MN
26	FE	*		7.88600+-	.84646	6.13608+-	.86973	6.64074+-	.58203	.84+-	.12	FE
28	NI			.00650+-	.00133	.00506+-	.00114	.01562+-	.01144	2.40+-	1.83	NI
29	CU			1.76460+-	.18333	1.37303+-	.19106	1.70170+-	.10791	.96+-	.12	CU
30	ZN	*		.25180+-	.02197	.19592+-	.02492	.23323+-	.01324	.93+-	.10	ZN
31	GA			<	.00070	<	.00094	.00048+-	.00111	.68+-	1.97	GA
33	AS	*		.14480+-	.02019	.11267+-	.01885	.13044+-	.01555	.90+-	.17	AS
34	SE			.01350+-	.00134	.01050+-	.00143	.00000+-	.00112	.00+-	.08	SE
35	BR	*		<	.00150	<	.00170	.00289+-	.00832	1.93+-	6.22	BR
37	RB			.01990+-	.00235	.01548+-	.00233	.02045+-	.00198	1.03+-	.16	RB
38	SR			.03200+-	.00355	.02490+-	.00360	.02201+-	.00213	.69+-	.10	SR
39	Y			.00760+-	.00163	.00591+-	.00138	.00549+-	.00148	.72+-	.25	Y
40	ZR			<	.00000	<	.00384	.00018+-	.00462	.00+-	.00	ZR
42	MO			.03380+-	.00479	.02630+-	.00445	.03931+-	.00356	1.16+-	.20	MO
46	PD			<	.00000	<	.00210	.00000+-	.00267	.00+-	.00	PD
47	AG			<	.00000	<	.00275	.00104+-	.00358	.00+-	.00	AG
48	CD			<	.00000	<	.00369	.01404+-	.00473	.00+-	.00	CD
49	IN			<	.00000	<	.00446	.00093+-	.00574	.00+-	.00	IN
50	SN			<	.00000	<	.00517	.00458+-	.00648	.00+-	.00	SN
51	SB			.02210+-	.01543	.01720+-	.01211	.01909+-	.01496	.86+-	.91	SB
56	BA			.09510+-	.02968	.07400+-	.02409	.00000+-	.02843	.00+-	.30	BA
57	LA			<	.00000	<	.03802	.00000+-	.04884	.00+-	.00	LA
80	HG			.00080+-	.00064	.00062+-	.00050	.00000+-	.00084	.00+-	1.05	HG
82	PB	*		.34230+-	.02982	.26634+-	.03386	.37351+-	.02588	1.09+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.1+- 1.1 COARSE: 118.4+-11.8 TOTAL: 128.5+-11.9

RESULTS FOR CMB SITE: HD 715 714 YEAR: 87 DATE: 0104
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9842
CHI SQUARE: 1.1895
DF: 7

#	TYPE	UG/M3		%	
5	5095	4.629+-	.602	33.985+-	5.673
13	KNECT	1.167+-	.268	8.572+-	2.160
16	SSFF1	.494+-	.112	3.624+-	.905
22	2NCD3	.456+-	.177	3.350+-	1.347
28	DUSTO	5.884+-	.462	43.207+-	5.653
	TOTAL:	12.630+-	.723	92.739+-	11.067

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			13.61920+-	1.42590	100.00000+-	14.80650	12.63030+-	.72324	.93+-	.11	TOTAL
13	AL		*	.48610+-	.06280	3.56923+-	.59352	.67453+-	.05977	1.39+-	.22	AL
14	SI		*	2.75860+-	.31330	20.25523+-	3.12878	2.42472+-	.22053	.88+-	.13	SI
15	P			<	.03880	<	.28791	.00333+-	.00265	.09+-	.11	P
16	S		*	1.18060+-	.13580	8.66864+-	1.34832	1.18060+-	.04902	1.00+-	.12	S
17	CL			.02100+-	.00640	.15419+-	.04969	.00218+-	.00253	.10+-	.12	CL
19	K		*	.24470+-	.02790	1.79673+-	.27812	.19212+-	.01802	.79+-	.12	K
20	CA		*	.24020+-	.02720	1.76369+-	.27200	.23382+-	.01743	.97+-	.13	CA
22	TI		*	.03920+-	.00460	.28783+-	.04527	.03877+-	.00360	.99+-	.15	TI
23	V			.00210+-	.00070	.01542+-	.00539	.00078+-	.00049	.37+-	.26	V
24	CR			.00220+-	.00040	.01615+-	.00339	.00038+-	.00020	.17+-	.09	CR
25	MN		*	.00630+-	.00090	.04626+-	.00819	.00602+-	.00050	.96+-	.16	MN
26	FE		*	.32680+-	.03680	2.39955+-	.36895	.33347+-	.02947	1.02+-	.15	FE
28	NI			.00040+-	.00040	.00294+-	.00295	.00095+-	.00075	2.37+-	3.02	NI
29	CU			.32730+-	.03670	2.40322+-	.36868	.05326+-	.00420	.16+-	.02	CU
30	ZN		*	.16290+-	.01840	1.19611+-	.18422	.15924+-	.01294	.98+-	.14	ZN
31	GA			<	.00000	<	.00661	.00021+-	.00063	.00+-	.00	GA
33	AS		*	.11040+-	.01760	.81062+-	.15461	.11679+-	.01050	1.06+-	.19	AS
34	SE			.01180+-	.00140	.08664+-	.01371	.00004+-	.00087	.00+-	.07	SE
35	BR		*	<	.00200	<	.01550	.00004+-	.00709	.02+-	3.54	BR
37	RB			<	.00000	<	.00367	.00070+-	.00016	.00+-	.00	RB
38	SR			.00140+-	.00060	.01028+-	.00454	.00135+-	.00017	.96+-	.43	SR
39	Y			<	.00000	<	.00734	.00095+-	.00058	.00+-	.00	Y
40	ZR			<	.00000	<	.02350	.00017+-	.00083	.00+-	.00	ZR
42	MO			<	.00000	<	.01395	.00196+-	.00050	.00+-	.00	MO
46	PD			<	.00000	<	.01395	.00015+-	.00049	.00+-	.00	PD
47	AG			<	.00000	<	.01909	.00028+-	.00056	.00+-	.00	AG
48	CD			.01690+-	.00400	.12409+-	.03212	.01483+-	.00142	.88+-	.22	CD
49	IN			<	.00000	<	.03010	.00055+-	.00105	.00+-	.00	IN
50	SN			<	.00000	<	.03671	.00460+-	.00128	.00+-	.00	SN
51	SB			<	.00000	<	.08003	.01212+-	.00278	.00+-	.00	SB
56	BA			<	.00000	<	.14318	.00062+-	.00486	.00+-	.00	BA
57	LA			<	.00000	<	.26800	.00298+-	.00958	.00+-	.00	LA
80	HG			.00060+-	.00040	.00441+-	.00297	.00003+-	.00060	.04+-	1.01	HG
82	PB		*	.22370+-	.02520	1.64253+-	.25261	.22174+-	.01563	.99+-	.13	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.6+- 1.4 COARSE: 34.4+- 3.5 TOTAL: 48.0+- 3.8

RESULTS FOR THE SITE [illegible] YEAR [illegible] DATE: [illegible]
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .97-9
CHI SQUARE: 1.3403
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.945+-	.481	5.651+-	1.509
13	KNECT	8.833+-	2.067	25.658+-	6.538
16	SSFF1	.000+-	.000	.000+-	.000
19	SSFF2	.176+-	.032	.510+-	.106
22	2NCD3	.000+-	.000	.000+-	.000
28	DUSTO	22.818+-	2.034	66.280+-	8.917
	TOTAL:	33.772+-	1.855	98.098+-	11.260

COARSE SUSPENDED PARTICULATE

	SPECIES	INCL	MISS FLG	MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			34.42620+-	3.46960	100.00000+-	14.25297	33.77156+-	1.85531	.98+-	.11	TOTAL
13	AL	*		1.88920+-	.23980	5.48768+-	.88943	1.98253+-	.16024	1.05+-	.16	AL
14	SI	*		9.02600+-	1.01600	26.21840+-	3.96132	7.27240+-	.60461	.81+-	.11	SI
15	P			<	.00000	<	.03340	.00487+-	.00578	.00+-	.00	P
16	S	*		.63590+-	.07620	1.84714+-	.28922	.61063+-	.04299	.96+-	.13	S
17	CL			.02030+-	.00680	.05897+-	.02063	.01752+-	.00308	.86+-	.33	CL
19	K	*		.78350+-	.08870	2.27588+-	.34496	.88214+-	.08102	1.13+-	.16	K
20	CA	*		1.72870+-	.19420	5.02147+-	.75785	1.87016+-	.12443	1.08+-	.14	CA
22	TI	*		.17810+-	.04050	.51734+-	.12868	.25115+-	.02292	1.41+-	.35	TI
23	V			<	.00890	<	.02656	.00505+-	.00194	.57+-	.62	V
24	CR			<	.00000	<	.00203	.00245+-	.00047	.00+-	.00	CR
25	MN	*		.03080+-	.00360	.08947+-	.01381	.02618+-	.00204	.85+-	.12	MN
26	FE	*		1.67830+-	.18880	4.87507+-	.73632	1.59822+-	.13348	.95+-	.13	FE
28	NI			<	.00020	<	.00145	.00320+-	.00246	16.01+-	41.86	NI
29	CU			.68500+-	.07750	1.98976+-	.30149	.26821+-	.01978	.39+-	.05	CU
30	ZN	*		.03000+-	.00540	.08714+-	.01798	.02874+-	.00361	.96+-	.21	ZN
31	GA			<	.00000	<	.00116	.00026+-	.00033	.00+-	.00	GA
33	AS	*		.00960+-	.00350	.02789+-	.01055	.01674+-	.00374	1.74+-	.75	AS
34	SE			.00070+-	.00030	.00203+-	.00090	.00011+-	.00046	.15+-	.66	SE
35	BR	*		.00150+-	.00040	.00436+-	.00124	.00077+-	.00320	.52+-	2.14	BR
37	RB			.00300+-	.00060	.00871+-	.00195	.00497+-	.00044	1.66+-	.36	RB
38	SR			.00790+-	.00100	.02295+-	.00371	.00765+-	.00056	.97+-	.14	SR
39	Y			.00160+-	.00160	.00465+-	.00467	.00165+-	.00033	1.03+-	1.05	Y
40	ZR			<	.00000	<	.00930	.00069+-	.00110	.00+-	.00	ZR
42	MO			.01110+-	.00200	.03224+-	.00666	.00698+-	.00081	.63+-	.13	MO
46	PD			<	.00000	<	.00465	.00000+-	.00063	.00+-	.00	PD
47	AG			<	.00000	<	.00668	.00000+-	.00084	.00+-	.00	AG
48	CD			<	.00000	<	.00842	.00080+-	.00113	.00+-	.00	CD
49	IN			<	.00000	<	.01075	.00089+-	.00134	.00+-	.00	IN
50	SN			<	.00000	<	.01249	.00147+-	.00154	.00+-	.00	SN
51	SB			<	.00000	<	.02643	.00350+-	.00355	.00+-	.00	SB
56	BA			<	.00000	<	.05054	.00000+-	.00667	.00+-	.00	BA
57	LA			<	.00000	<	.09266	.00619+-	.01143	.00+-	.00	LA
80	HG			<	.00000	<	.00087	.00004+-	.00031	.00+-	.00	HG
82	PB	*		.02610+-	.00410	.07581+-	.01415	.02014+-	.00287	.77+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.6+- 1.4 COARSE: 34.4+- 3.5 TOTAL: 48.0+- 3.8

RESULTS FOR CMB SITE: MD 715 714 YEAR: 87 DATE: 0104
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9749
CHI SQUARE: 1.3403
DF: 8

#	TYPE	UG/M3		%	
5	5095	4.629+-	.602	9.634+-	1.461
7	GYPSU	1.945+-	.481	4.049+-	1.050
13	KNECT	10.000+-	2.085	20.815+-	4.633
16	SSFF1	.494+-	.112	1.027+-	.246
19	SSFF2	.176+-	.032	.365+-	.072
22	2NCD3	.456+-	.177	.950+-	.376
28	DUSTO	28.702+-	2.085	59.740+-	6.371
	TOTAL:	46.402+-	1.991	96.579+-	8.604

	SPECIES	INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			48.04540+-	3.75118	100.00000+-	11.04156	46.40186+-	1.99130	.97+-	.09	TOTAL
13	AL		*	2.37530+-	.24789	4.94387+-	.64435	2.65707+-	.17102	1.12+-	.14	AL
14	SI		*	11.78460+-	1.06321	24.52805+-	2.92650	9.69712+-	.64357	.82+-	.09	SI
15	P			<	.03880	<	.08486	.00819+-	.00636	.21+-	.28	P
16	S		*	1.81650+-	.15572	3.78080+-	.43838	1.79123+-	.06520	.99+-	.09	S
17	CL			.04130+-	.00934	.08596+-	.02056	.01971+-	.00399	.48+-	.14	CL
19	K		*	1.02820+-	.09298	2.14006+-	.25568	1.07426+-	.08300	1.04+-	.12	K
20	CA		*	1.96890+-	.19610	4.09800+-	.51861	2.10398+-	.12565	1.07+-	.12	CA
22	TI		*	.21730+-	.04076	.45228+-	.09189	.28992+-	.02320	1.33+-	.27	TI
23	V			.01100+-	.00913	.02290+-	.01908	.00583+-	.00200	.53+-	.48	V
24	CR			.00220+-	.00081	.00458+-	.00172	.00284+-	.00051	1.29+-	.53	CR
25	MN		*	.03710+-	.00371	.07722+-	.00980	.03220+-	.00210	.87+-	.10	MN
26	FE		*	2.00510+-	.19235	4.17334+-	.51619	1.93169+-	.13669	.96+-	.11	FE
28	NI			<	.00060	<	.00134	.00415+-	.00257	6.92+-	8.53	NI
29	CU			1.01230+-	.08575	2.10697+-	.24273	.32147+-	.02022	.32+-	.03	CU
30	ZN		*	.19290+-	.01918	.40150+-	.05075	.18798+-	.01344	.97+-	.12	ZN
31	GA			<	.00000	<	.00205	.00047+-	.00071	.00+-	.00	GA
33	AS		*	.12000+-	.01794	.24976+-	.04213	.13353+-	.01115	1.11+-	.19	AS
34	SE			.01250+-	.00143	.02602+-	.00361	.00014+-	.00098	.01+-	.08	SE
35	BR		*	.00350+-	.00214	.00728+-	.00449	.00081+-	.00778	.23+-	2.23	BR
37	RB			.00300+-	.00078	.00624+-	.00170	.00568+-	.00047	1.89+-	.52	RB
38	SR			.00930+-	.00117	.01936+-	.00286	.00899+-	.00059	.97+-	.14	SR
39	Y			<	.00160	<	.00394	.00260+-	.00067	1.63+-	1.96	Y
40	ZR			<	.00000	<	.00942	.00086+-	.00138	.00+-	.00	ZR
42	MO			.01110+-	.00276	.02310+-	.00602	.00894+-	.00095	.81+-	.22	MO
46	PD			<	.00000	<	.00517	.00015+-	.00080	.00+-	.00	PD
47	AG			<	.00000	<	.00723	.00028+-	.00101	.00+-	.00	AG
48	CD			.01690+-	.00494	.03518+-	.01064	.01563+-	.00181	.92+-	.29	CD
49	IN			<	.00000	<	.01149	.00143+-	.00170	.00+-	.00	IN
50	SN			<	.00000	<	.01373	.00607+-	.00201	.00+-	.00	SN
51	SB			<	.00000	<	.02955	.01562+-	.00451	.00+-	.00	SB
56	BA			<	.00000	<	.05440	.00062+-	.00826	.00+-	.00	BA
57	LA			<	.00000	<	.10089	.00917+-	.01492	.00+-	.00	LA
80	HG			.00060+-	.00050	.00125+-	.00105	.00007+-	.00068	.12+-	1.13	HG
82	PB		*	.24980+-	.02553	.51992+-	.06687	.24189+-	.01589	.97+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 13.6+- 1.4 COARSE: 34.4+- 3.5 TOTAL: 48.0+- 3.8

RESULTS FOR CMB SITE [illegible] YEAR: 87 DATE: [illegible]
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9408
CHI SQUARE: 5.1492
DF: 6

#	TYPE	UG/M3		%	
5	5095	3.858+-	.576	33.729+-	6.182
10	TRANS	1.454+-	.520	12.711+-	4.745
13	KNECT	.339+-	.119	2.965+-	1.091
19	SSFF2	.251+-	.043	2.190+-	.442
26	CHORM	.716+-	.237	6.263+-	2.178
28	DUSTO	2.904+-	.272	25.390+-	3.596
	TOTAL:	9.522+-	.713	83.248+-	10.818

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			11.43800+-	1.21520	100.00000+-	15.02494	9.52193+-	.71258	.83+-	.11	TOTAL
13	AL	*		.21260+-	.02900	1.85872+-	.32137	.33213+-	.02941	1.56+-	.25	AL
14	SI	*		1.24240+-	.14170	10.86204+-	1.69307	1.19237+-	.10851	.96+-	.14	SI
15	P			<	.00000	<	.05158	.00256+-	.00243	.00+-	.00	P
16	S	*		1.11400+-	.12640	9.73946+-	1.51391	1.11400+-	.04139	1.00+-	.12	S
17	CL			.04760+-	.00730	.41616+-	.07764	.02231+-	.00560	.47+-	.14	CL
19	K	*		.18450+-	.02110	1.61304+-	.25179	.09583+-	.00890	.52+-	.08	K
20	CA	*		.10340+-	.01190	.90400+-	.14159	.10056+-	.00678	.97+-	.13	CA
22	TI	*		.02020+-	.00250	.17660+-	.02881	.01942+-	.00178	.96+-	.15	TI
23	V			.00140+-	.00050	.01224+-	.00456	.00047+-	.00025	.34+-	.21	V
24	CR			.00160+-	.00040	.01399+-	.00380	.00042+-	.00010	.26+-	.09	CR
25	MN	*		.00420+-	.00060	.03672+-	.00654	.00328+-	.00027	.78+-	.13	MN
26	FE	*		.24280+-	.02740	2.12275+-	.32901	.26887+-	.01819	1.11+-	.15	FE
28	NI			.00130+-	.00040	.01137+-	.00370	.00130+-	.00092	1.00+-	.77	NI
29	CU			.18010+-	.02030	1.57458+-	.24389	.18923+-	.01660	1.05+-	.15	CU
30	ZN	*		.11720+-	.01330	1.02465+-	.15928	.09673+-	.00705	.83+-	.11	ZN
31	GA			<	.00000	<	.00437	.00001+-	.00046	.00+-	.00	GA
33	AS	*		.02710+-	.00650	.23693+-	.06215	.03823+-	.00343	1.41+-	.36	AS
34	SE			.02220+-	.00260	.19409+-	.03069	.00012+-	.00042	.01+-	.02	SE
35	BR	*		.00600+-	.00110	.05246+-	.01112	.00872+-	.00382	1.45+-	.69	BR
37	RB			<	.00000	<	.00350	.00035+-	.00007	.00+-	.00	RB
38	SR			<	.00000	<	.00437	.00073+-	.00010	.00+-	.00	SR
39	Y			<	.00000	<	.00612	.00038+-	.00019	.00+-	.00	Y
40	ZR			<	.00000	<	.02623	.00003+-	.00041	.00+-	.00	ZR
42	MO			<	.00000	<	.01486	.00218+-	.00027	.00+-	.00	MO
46	PD			<	.00000	<	.01486	.00004+-	.00025	.00+-	.00	PD
47	AG			<	.00000	<	.02098	.00001+-	.00029	.00+-	.00	AG
48	CD			.00430+-	.00310	.03759+-	.02740	.00279+-	.00051	.65+-	.48	CD
49	IN			<	.00000	<	.03147	.00019+-	.00053	.00+-	.00	IN
50	SN			<	.00000	<	.03759	.00229+-	.00066	.00+-	.00	SN
51	SB			<	.00000	<	.08743	.00545+-	.00157	.00+-	.00	SB
56	BA			<	.00000	<	.15999	.00133+-	.00254	.00+-	.00	BA
57	LA			<	.00000	<	.28939	.00086+-	.00480	.00+-	.00	LA
80	HG			<	.00000	<	.00262	.00001+-	.00027	.00+-	.00	HG
82	PB	*		.09870+-	.01130	.86291+-	.13478	.09279+-	.01079	.94+-	.15	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.4+- 1.2 COARSE: 22.7+- 2.3 TOTAL: 34.1+- 2.6

RESULTS FOR CMB SITE: MD 751 750 YEAR: 87 DATE: 0107
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9721
CHI SQUARE: 1.5555
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.684+-	.353	7.428+-	1.729
10	TRANS	.000+-	.000	.000+-	.000
13	KNECT	7.608+-	1.638	33.562+-	7.989
19	SSFF2	.170+-	.026	.751+-	.139
26	CHORM	.000+-	.000	.000+-	.000
28	DUSTO	10.812+-	1.268	47.695+-	7.399
	TOTAL:	20.274+-	1.115	89.435+-	10.328

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			22.66890+-	2.30170	100.00000+-	14.35930	20.27399+-	1.11507	.89+-	.10	TOTAL
13	AL	*		1.08570+-	.13770	4.78938+-	.77812	1.11085+-	.08235	1.02+-	.15	AL
14	SI	*		4.87400+-	.55640	21.50082+-	3.28486	3.98356+-	.30317	.82+-	.11	SI
15	P			<	.00000	<	.03132	.00419+-	.00299	.00+-	.00	P
16	S	*		.44940+-	.05510	1.98245+-	.31559	.45185+-	.03478	1.01+-	.15	S
17	CL			.07490+-	.01310	.33041+-	.06682	.01509+-	.00206	.20+-	.04	CL
19	K	*		.51420+-	.05830	2.26831+-	.34523	.44729+-	.03876	.87+-	.12	K
20	CA	*		1.51590+-	.16990	6.68714+-	1.01131	1.49744+-	.10510	.99+-	.13	CA
22	TI	*		.09210+-	.02090	.40628+-	.10100	.12800+-	.01099	1.39+-	.34	TI
23	V			<	.00430	<	.01994	.00307+-	.00095	.71+-	.78	V
24	CR			<	.00000	<	.00221	.00166+-	.00026	.00+-	.00	CR
25	MN	*		.01350+-	.00160	.05955+-	.00929	.01510+-	.00109	1.12+-	.16	MN
26	FE	*		.85580+-	.09640	3.77522+-	.57251	.87242+-	.06628	1.02+-	.14	FE
28	NI			.00040+-	.00040	.00176+-	.00177	.00181+-	.00119	4.53+	5.42	NI
29	CU			.30890+-	.03510	1.36266+-	.20765	.16068+-	.01041	.52+-	.07	CU
30	ZN	*		.03330+-	.00450	.14690+-	.02483	.02447+-	.00339	.73+-	.14	ZN
31	GA			.00150+-	.00150	.00662+-	.00665	.00023+-	.00030	.15+-	.25	GA
33	AS	*		.00790+-	.00220	.03485+-	.01033	.01601+-	.00361	2.03+-	.73	AS
34	SE			<	.00020	<	.00177	.00009+-	.00044	.46+-	2.37	SE
35	BR	*		.00180+-	.00040	.00794+-	.00194	.00045+-	.00307	.25+-	1.71	BR
37	RB			.00160+-	.00040	.00706+-	.00190	.00259+-	.00022	1.62+-	.43	RB
38	SR			.00500+-	.00070	.02206+-	.00381	.00476+-	.00034	.95+-	.15	SR
39	Y			.00060+-	.00060	.00265+-	.00266	.00100+-	.00022	1.67+-	1.71	Y
40	ZR			<	.00000	<	.01235	.00059+-	.00060	.00+-	.00	ZR
42	MO			<	.00030	<	.00662	.00361+-	.00041	12.04+-	60.20	MO
46	PD			<	.00000	<	.00662	.00000+-	.00033	.00+-	.00	PD
47	AG			<	.00000	<	.00882	.00000+-	.00045	.00+-	.00	AG
48	CD			<	.00000	<	.01147	.00077+-	.00064	.00+-	.00	CD
49	IN			<	.00000	<	.01368	.00081+-	.00070	.00+-	.00	IN
50	SN			<	.00000	<	.01632	.00136+-	.00085	.00+-	.00	SN
51	SB			<	.00000	<	.03706	.00318+-	.00195	.00+-	.00	SB
56	BA			<	.00000	<	.06926	.00000+-	.00350	.00+-	.00	BA
57	LA			<	.00000	<	.12572	.00533+-	.00600	.00+-	.00	LA
80	HG			<	.00000	<	.00132	.00004+-	.00028	.00+-	.00	HG
82	PB	*		.02010+-	.00290	.08867+-	.01564	.01842+-	.00275	.92+-	.19	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.4+- 1.2 COARSE: 22.7+- 2.3 TOTAL: 34.1+- 2.6

RESULTS FOR CMB SITE: NO TEST TSC YEAR: ET DATE: [illegible]
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9721
CHI SQUARE: 1.5555
DF: 8

#	TYPE	UG/M3		%	
5	5095	3.858+-	.576	11.311+-	1.897
7	GYPSU	1.684+-	.353	4.937+-	1.100
10	TRANS	1.454+-	.520	4.263+-	1.560
13	KNECT	7.947+-	1.642	23.301+-	5.133
19	SSFF2	.421+-	.050	1.234+-	.175
26	CHDRM	.716+-	.237	2.100+-	.714
28	DUSTO	13.716+-	1.297	40.215+-	4.886
	TOTAL:	29.796+-	1.323	87.360+-	7.714

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			34.10690+-	2.60279	100.00000+-	10.79226	29.79593+-	1.32331	.87+-	.08	TOTAL
13	AL	*		1.29830+-	.14072	3.80656+-	.50459	1.44298+-	.08744	1.11+-	.14	AL
14	SI	*		6.1164D+-	.57416	17.93303+-	2.16950	5.17593+-	.32200	.85+-	.10	SI
15	P			<	.00000	<	.02707	.00675+-	.00385	.00+-	.00	P
16	S	*		1.56340+-	.13789	4.58382+-	.53461	1.56585+-	.05406	1.00+-	.09	S
17	CL			.12250+-	.01500	.35916+-	.05181	.03741+-	.00596	.31+-	.06	CL
19	K	*		.69870+-	.06200	2.04856+-	.23976	.54313+-	.03977	.78+-	.09	K
20	CA	*		1.61930+-	.17032	4.74772+-	.61695	1.59801+-	.10532	.99+-	.12	CA
22	TI	*		.11230+-	.02105	.32926+-	.06663	.14742+-	.01113	1.31+-	.27	TI
23	V			.00570+-	.00453	.01671+-	.01334	.00354+-	.00098	.62+-	.52	V
24	CR			.00160+-	.00064	.00469+-	.00191	.00208+-	.00028	1.30+-	.55	CR
25	MN	*		.01770+-	.00171	.05190+-	.00639	.01838+-	.00112	1.04+-	.12	MN
26	FE	*		1.09860+-	.10022	3.22105+-	.38309	1.14129+-	.06873	1.04+-	.11	FE
28	NI			.00170+-	.00057	.00498+-	.00170	.00311+-	.00150	1.83+-	1.07	NI
29	CU			.48900+-	.04055	1.43373+-	.16157	.34991+-	.01959	.72+-	.07	CU
30	ZN	*		.15050+-	.01404	.44126+-	.05318	.12120+-	.00782	.81+-	.09	ZN
31	GA			<	.00150	<	.00465	.00024+-	.00055	.16+-	.40	GA
33	AS	*		.03500+-	.00686	.10262+-	.02159	.05424+-	.00498	1.55+-	.34	AS
34	SE			.02240+-	.00263	.06568+-	.00920	.00021+-	.00061	.01+-	.03	SE
35	BR	*		.00780+-	.00117	.02287+-	.00385	.00916+-	.00490	1.17+-	.65	BR
37	RB			.00160+-	.00057	.00469+-	.00170	.00294+-	.00023	1.84+-	.66	RB
38	SR			.00500+-	.00086	.01466+-	.00276	.00549+-	.00035	1.10+-	.20	SR
39	Y			<	.00060	<	.00271	.00139+-	.00029	2.31+-	3.59	Y
40	ZR			<	.00000	<	.01203	.00062+-	.00073	.00+-	.00	ZR
42	MO			<	.00030	<	.00665	.00579+-	.00050	19.29+-	145.81	MO
46	PD			<	.00000	<	.00665	.00004+-	.00042	.00+-	.00	PD
47	AG			<	.00000	<	.00916	.00001+-	.00053	.00+-	.00	AG
48	CD			.00430+-	.00405	.01261+-	.01190	.00356+-	.00082	.83+-	.80	CD
49	IN			<	.00000	<	.01393	.00100+-	.00088	.00+-	.00	IN
50	SN			<	.00000	<	.01663	.00365+-	.00108	.00+-	.00	SN
51	SB			<	.00000	<	.03829	.00863+-	.00250	.00+-	.00	SB
56	BA			<	.00000	<	.07069	.00133+-	.00432	.00+-	.00	BA
57	LA			<	.00000	<	.12807	.00620+-	.00768	.00+-	.00	LA
80	HG			<	.00000	<	.00124	.00005+-	.00038	.00+-	.00	HG
82	PB	*		.11880+-	.01167	.34832+-	.04332	.11121+-	.01114	.94+-	.13	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 11.4+- 1.2 COARSE: 22.7+- 2.3 TOTAL: 34.1+- 2.6

RESULTS FOR CMB SITE: GR 755 754 YEAR: 87 DATE: 0107
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9352
CHI SQUARE: 4.3524
DF: 7

#	TYPE	UG/M3		%	
5	5095	3.398+-	.446	34.598+-	5.889
7	GYPSU	.110+-	.039	1.123+-	.413
10	TRANS	.796+-	.348	8.104+-	3.646
19	SSFF2	.209+-	.026	2.126+-	.354
28	DUSTO	2.047+-	.146	20.843+-	2.708
	TOTAL:	6.560+-	.535	66.794+-	9.063

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			9.82110+-	1.06550	100.00000+-	15.34293	6.55992+-	.53456	.67+-	.09	TOTAL
13	AL	*		.17630+-	.02330	1.79511+-	.30694	.21046+-	.02063	1.19+-	.20	AL
14	SI	*		.85500+-	.09780	8.70575+-	1.37249	.76602+-	.07630	.90+-	.14	SI
15	P			<	.02120	<	.21814	.00140+-	.00145	.07+-	.10	P
16	S	*		.88380+-	.10050	8.99899+-	1.41433	.88380+-	.03470	1.00+-	.12	S
17	CL			.02830+-	.00520	.28816+-	.06149	.01187+-	.00311	.42+-	.13	CL
19	K	*		.13380+-	.01540	1.36237+-	.21549	.06366+-	.00626	.48+-	.07	K
20	CA	*		.06070+-	.00720	.61806+-	.09935	.06070+-	.00441	1.00+-	.14	CA
22	TI	*		.00930+-	.00130	.09469+-	.01676	.01265+-	.00125	1.36+-	.23	TI
23	V			.00040+-	.00030	.00407+-	.00309	.00023+-	.00017	.58+-	.61	V
24	CR			.00050+-	.00030	.00509+-	.00310	.00007+-	.00007	.15+-	.16	CR
25	MN	*		.00270+-	.00050	.02749+-	.00590	.00184+-	.00018	.68+-	.14	MN
26	FE	*		.09580+-	.01090	.97545+-	.15335	.10772+-	.01038	1.12+-	.17	FE
28	NI			.00030+-	.00030	.00305+-	.00307	.00029+-	.00027	.96+-	1.32	NI
29	CU			.04010+-	.00460	.40830+-	.06447	.01547+-	.00148	.39+-	.06	CU
30	ZN	*		.06900+-	.00780	.70257+-	.11008	.05588+-	.00528	.81+-	.12	ZN
31	GA			.00070+-	.00040	.00713+-	.00415	.00000+-	.00038	.00+-	.55	GA
33	AS	*		.02090+-	.00440	.21281+-	.05040	.02859+-	.00284	1.37+-	.32	AS
34	SE			.01120+-	.00140	.11404+-	.01888	.00001+-	.00034	.00+-	.03	SE
35	BR	*		.00350+-	.00070	.03564+-	.00811	.00460+-	.00263	1.31+-	.80	BR
37	RB			<	.00000	<	.00407	.00021+-	.00005	.00+-	.00	RB
38	SR			<	.00000	<	.00509	.00040+-	.00007	.00+-	.00	SR
39	Y			<	.00000	<	.00611	.00026+-	.00015	.00+-	.00	Y
40	ZR			<	.00000	<	.02851	.00000+-	.00028	.00+-	.00	ZR
42	MO			<	.00000	<	.01629	.00079+-	.00018	.00+-	.00	MO
46	PD			<	.00000	<	.01629	.00000+-	.00017	.00+-	.00	PD
47	AG			<	.00000	<	.02240	.00000+-	.00019	.00+-	.00	AG
48	CD			<	.00000	<	.02953	.00224+-	.00036	.00+-	.00	CD
49	IN			<	.00000	<	.03666	.00015+-	.00036	.00+-	.00	IN
50	SN			<	.00000	<	.04277	.00191+-	.00046	.00+-	.00	SN
51	SB			<	.00000	<	.09775	.00450+-	.00106	.00+-	.00	SB
56	BA			<	.00000	<	.17921	.00063+-	.00170	.00+-	.00	BA
57	LA			<	.00000	<	.33092	.00000+-	.00327	.00+-	.00	LA
80	HG			<	.00020	<	.00306	.00000+-	.00022	.00+-	1.11	HG
82	PB	*		.06360+-	.00730	.64759+-	.10228	.06293+-	.00677	.99+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.8+- 1.1 COARSE: 52.4+- 5.2 TOTAL: 62.2+- 5.4

RESULTS FOR CMB SITE: GR [illegible] YEAR: [illegible] DATE: [illegible]
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9622
CHI SQUARE: 2.1006
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	1.384+-	.381	2.641+-	.774
10	TRANS	.000+-	.000	.000+-	.000
19	SSFF2	.000+-	.000	.000+-	.000
24	SLPR2	.064+-	.012	.121+-	.026
26	CHDRM	.206+-	.134	.394+-	.259
28	DUSTO	43.289+-	2.871	82.623+-	9.928
	TOTAL:	44.942+-	2.740	85.779+-	10.061

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			52.39280+-	5.24930	100.00000+-	14.16918	44.94214+-	2.74014	.86+-	.10	TOTAL
13	AL	*		3.63480+-	.45100	6.93759+-	1.10640	2.92324+-	.29215	.80+-	.13	AL
14	SI	*		14.90160+-	1.66640	28.44208+-	4.27044	11.17708+-	1.11680	.75+-	.11	SI
15	P			<	.07020	<	.13941	.00000+-	.01057	.00+-	.15	P
16	S	*		.61290+-	.07240	1.16982+-	.18120	.65784+-	.04523	1.07+-	.15	S
17	CL			.09910+-	.01570	.18915+-	.03546	.00000+-	.00456	.00+-	.05	CL
19	K	*		1.98770+-	.22270	3.79384+-	.57023	1.53172+-	.15307	.77+-	.12	K
20	CA	*		.96890+-	.10900	1.84930+-	.27859	.88980+-	.06501	.92+-	.12	CA
22	TI	*		.27870+-	.06250	.53194+-	.13066	.43259+-	.04325	1.55+-	.38	TI
23	V			<	.01530	<	.02954	.00628+-	.00364	.41+-	.48	V
24	CR			<	.00000	<	.00153	.00227+-	.00082	.00+-	.00	CR
25	MN	*		.03080+-	.00360	.05879+-	.00905	.03653+-	.00364	1.19+-	.18	MN
26	FE	*		2.10150+-	.23540	4.01105+-	.60280	2.51491+-	.24781	1.20+-	.18	FE
28	NI			.00150+-	.00050	.00286+-	.00100	.00486+-	.00464	3.24+-	3.27	NI
29	CU			.45610+-	.05120	.87054+-	.13099	.40404+-	.03598	.89+-	.13	CU
30	ZN	*		.03480+-	.00480	.06642+-	.01132	.03360+-	.00246	.97+-	.15	ZN
31	GA			<	.00000	<	.00076	.00005+-	.00027	.00+-	.00	GA
33	AS	*		.00770+-	.00230	.01470+-	.00463	.01012+-	.00147	1.31+-	.44	AS
34	SE			.00040+-	.00030	.00076+-	.00058	.00003+-	.00020	.08+-	.49	SE
35	BR	*		.00200+-	.00040	.00382+-	.00085	.00108+-	.00132	.54+-	.67	BR
37	RB			.00730+-	.00100	.01393+-	.00236	.00833+-	.00082	1.14+-	.19	RB
38	SR			.01340+-	.00160	.02558+-	.00399	.00900+-	.00091	.67+-	.11	SR
39	Y			.00460+-	.00090	.00878+-	.00193	.00208+-	.00052	.45+-	.14	Y
40	ZR			<	.00000	<	.00687	.00000+-	.00195	.00+-	.00	ZR
42	MO			.01260+-	.00220	.02405+-	.00484	.01262+-	.00147	1.00+-	.21	MO
46	PD			<	.00000	<	.00344	.00000+-	.00113	.00+-	.00	PD
47	AG			<	.00000	<	.00439	.00005+-	.00152	.00+-	.00	AG
48	CD			<	.00000	<	.00573	.00095+-	.00195	.00+-	.00	CD
49	IN			<	.00000	<	.00725	.00009+-	.00242	.00+-	.00	IN
50	SN			<	.00000	<	.00840	.00046+-	.00273	.00+-	.00	SN
51	SB			<	.00000	<	.01890	.00101+-	.00628	.00+-	.00	SB
56	BA			<	.00000	<	.03512	.00000+-	.01203	.00+-	.00	BA
57	LA			<	.00000	<	.06279	.00000+-	.02061	.00+-	.00	LA
80	HG			.00070+-	.00070	.00134+-	.00134	.00000+-	.00027	.00+-	.39	HG
82	PB	*		.02580+-	.00340	.04924+-	.00815	.02388+-	.00214	.93+-	.15	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.8+- 1.1 COARSE: 52.4+- 5.2 TOTAL: 62.2+- 5.4

RESULTS FOR CMB SITE: GR 755 754 YEAR: 87 DATE: 0107
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9622
CHI SQUARE: 2.1006
DF: 8

#	TYPE	UG/M3		%	
5	5095	3.398+-	.446	5.462+-	.857
7	GYPSU	1.494+-	.383	2.401+-	.650
10	TRANS	.796+-	.348	1.279+-	.569
19	SSFF2	.209+-	.026	.336+-	.051
24	SLPR2	.064+-	.012	.102+-	.021
26	CNORM	.206+-	.134	.332+-	.218
28	DUSTO	45.336+-	2.875	72.870+-	7.792
	TOTAL:	51.502+-	2.792	82.782+-	8.422

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			62.21390+-	5.35635	100.00000+-	12.17576	51.50206+-	2.79180	.83+-	.08	TOTAL
13	AL	*		3.81110+-	.45160	6.12580+-	.89725	3.13369+-	.29288	.82+-	.12	AL
14	SI	*		15.75660+-	1.66927	25.32649+-	3.45741	11.94310+-	1.11941	.76+-	.11	SI
15	P			.09140+-	.07576	.14691+-	.12242	.00140+-	.01066	.02+-	.12	P
16	S	*		1.49670+-	.12386	2.40573+-	.28729	1.54164+-	.05701	1.03+-	.09	S
17	CL			.12740+-	.01654	.20478+-	.03190	.01187+-	.00552	.09+-	.04	CL
19	K	*		2.12150+-	.22323	3.41001+-	.46362	1.59538+-	.15320	.75+-	.11	K
20	CA	*		1.02960+-	.10924	1.65494+-	.22612	.95050+-	.06516	.92+-	.12	CA
22	TI	*		.28800+-	.06251	.46292+-	.10810	.44524+-	.04326	1.55+-	.37	TI
23	V			.01570+-	.01540	.02524+-	.02485	.00651+-	.00364	.41+-	.47	V
24	CR			<	.00050	<	.00138	.00235+-	.00083	4.69+-	8.19	CR
25	MN	*		.03350+-	.00363	.05385+-	.00746	.03837+-	.00364	1.15+-	.17	MN
26	FE	*		2.19730+-	.23565	3.53185+-	.48573	2.62263+-	.24803	1.19+-	.17	FE
28	NI			.00180+-	.00058	.00289+-	.00097	.00515+-	.00465	2.86+-	2.74	NI
29	CU			.49620+-	.05141	.79757+-	.10744	.41951+-	.03601	.85+-	.11	CU
30	ZN	*		.10380+-	.00916	.16684+-	.02057	.08948+-	.00582	.86+-	.09	ZN
31	GA			.00070+-	.00057	.00113+-	.00091	.00005+-	.00047	.08+-	.67	GA
33	AS	*		.02860+-	.00496	.04597+-	.00891	.03871+-	.00320	1.35+-	.26	AS
34	SE			.01160+-	.00143	.01865+-	.00281	.00004+-	.00039	.00+-	.03	SE
35	BR	*		.00550+-	.00081	.00884+-	.00150	.00568+-	.00295	1.03+-	.56	BR
37	RB			.00730+-	.00108	.01173+-	.00200	.00854+-	.00082	1.17+-	.21	RB
38	SR			.01340+-	.00168	.02154+-	.00327	.00940+-	.00091	.70+-	.11	SR
39	Y			.00460+-	.00108	.00739+-	.00185	.00234+-	.00055	.51+-	.17	Y
40	ZR			<	.00000	<	.00733	.00000+-	.00197	.00+-	.00	ZR
42	MO			.01260+-	.00272	.02025+-	.00471	.01341+-	.00148	1.06+-	.26	MO
46	PD			<	.00000	<	.00387	.00000+-	.00114	.00+-	.00	PD
47	AG			<	.00000	<	.00512	.00005+-	.00153	.00+-	.00	AG
48	CD			<	.00000	<	.00671	.00319+-	.00198	.00+-	.00	CD
49	IN			<	.00000	<	.00841	.00025+-	.00245	.00+-	.00	IN
50	SN			<	.00000	<	.00978	.00237+-	.00277	.00+-	.00	SN
51	SB			<	.00000	<	.02217	.00551+-	.00637	.00+-	.00	SB
56	BA			<	.00000	<	.04093	.00063+-	.01215	.00+-	.00	BA
57	LA			<	.00000	<	.07433	.00000+-	.02086	.00+-	.00	LA
80	HG			.00090+-	.00076	.00145+-	.00123	.00000+-	.00035	.00+-	.39	HG
82	PB	*		.08940+-	.00805	.14370+-	.01791	.08681+-	.00710	.97+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.8+- 1.1 COARSE: 52.4+- 5.2 TOTAL: 62.2+- 5.4

RES[illegible]TS FOR [illegible] SITE [illegible] YEAR [illegible] DATE [illegible]
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9225
CHI SQUARE: 4.1168
DF: 8

#	TYPE	UG/M3		%	
5	5095	1.711+-	.254	27.659+-	5.296
7	GYPSU	.261+-	.051	4.223+-	.966
24	SLPR2	.328+-	.033	5.311+-	.838
28	DUSTO	1.499+-	.111	24.241+-	3.432
	TOTAL:	3.800+-	.275	61.434+-	8.636

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			6.18470+-	.74580	100.00000+-	17.05371	3.79954+-	.27450	.61+-	.09	TOTAL
13	AL	*		.12050+-	.01670	1.94836+-	.35793	.15079+-	.01510	1.25+-	.21	AL
14	SI	*		.79480+-	.09010	12.85107+-	2.12693	.55866+-	.05599	.70+-	.11	SI
15	P			<	.01020	<	.16772	.00057+-	.00137	.06+-	.15	P
16	S	*		.47660+-	.05680	7.70611+-	1.30652	.47660+-	.02036	1.00+-	.13	S
17	CL			.01330+-	.00470	.21505+-	.08030	.00000+-	.00154	.00+-	.12	CL
19	K	*		.09370+-	.01100	1.51503+-	.25497	.04679+-	.00459	.50+-	.08	K
20	CA	*		.08190+-	.00950	1.32424+-	.22157	.08190+-	.00687	1.00+-	.14	CA
22	TI	*		.00630+-	.00100	.10186+-	.02031	.00915+-	.00093	1.45+-	.27	TI
23	V			<	.00000	<	.00647	.00013+-	.00013	.00+-	.00	V
24	CR			.00130+-	.00040	.02102+-	.00695	.00005+-	.00005	.04+-	.04	CR
25	MN	*		.00070+-	.00050	.01132+-	.00820	.00125+-	.00013	1.79+-	1.29	MN
26	FE	*		.07340+-	.00850	1.18680+-	.19842	.07472+-	.00745	1.02+-	.16	FE
28	NI			.00060+-	.00040	.00970+-	.00657	.00016+-	.00026	.27+-	.47	NI
29	CU			.14690+-	.01650	2.37522+-	.39142	.01066+-	.00104	.07+-	.01	CU
30	ZN	*		.05550+-	.00640	.89738+-	.14973	.05861+-	.00581	1.06+-	.16	ZN
31	GA			<	.00020	<	.00971	.00000+-	.00030	.00+-	1.49	GA
33	AS	*		.02790+-	.00800	.45111+-	.14032	.04350+-	.00595	1.56+-	.50	AS
34	SE			.00990+-	.00120	.16007+-	.02737	.00000+-	.00038	.00+-	.04	SE
35	BR	*		.00120+-	.00090	.01940+-	.01474	.00000+-	.00333	.00+-	2.78	BR
37	RB			<	.00000	<	.00970	.00015+-	.00006	.00+-	.00	RB
38	SR			<	.00000	<	.01132	.00026+-	.00005	.00+-	.00	SR
39	Y			<	.00000	<	.01455	.00037+-	.00032	.00+-	.00	Y
40	ZR			<	.00000	<	.06144	.00003+-	.00023	.00+-	.00	ZR
42	MO			<	.00000	<	.03719	.00103+-	.00015	.00+-	.00	MO
46	PD			<	.00000	<	.03719	.00000+-	.00012	.00+-	.00	PD
47	AG			<	.00000	<	.05012	.00000+-	.00015	.00+-	.00	AG
48	CD			.01540+-	.00460	.24900+-	.08021	.00508+-	.00057	.33+-	.11	CD
49	IN			<	.00000	<	.08084	.00000+-	.00027	.00+-	.00	IN
50	SN			<	.00000	<	.09701	.00253+-	.00041	.00+-	.00	SN
51	SB			<	.00000	<	.21505	.00505+-	.00088	.00+-	.00	SB
56	BA			<	.00000	<	.39129	.00000+-	.00122	.00+-	.00	BA
57	LA			<	.00000	<	.73084	.00000+-	.00240	.00+-	.00	LA
80	HG			<	.00030	<	.00811	.00000+-	.00036	.00+-	1.20	HG
82	PB	*		.12870+-	.01460	2.08094+-	.34452	.10083+-	.01007	.78+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 6.2+- .7 COARSE: 28.2+- 2.8 TOTAL: 34.4+- 2.9

RESULTS FOR CMB SITE: MD 761 760 YEAR: 87 DATE: 0111
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9328
CHI SQUARE: 2.9141
DF: 9

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	2.532+-	.349	8.990+-	1.535
23	SLPR#	.035+-	.007	.124+-	.028
24	SLPR2	.000+-	.000	.000+-	.000
28	DUSTO	19.002+-	1.267	67.465+-	8.163
	TOTAL:	21.569+-	1.251	76.579+-	8.917

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			28.16550+-	2.84390	100.00000+-	14.27946	21.56891+-	1.25068	.77+-	.09	TOTAL
13	AL	*		1.70790+-	.21280	6.06380+-	.97247	1.28252+-	.12824	.75+-	.12	AL
14	SI	*		7.72700+-	.86510	27.43427+-	4.13610	4.90313+-	.49023	.63+-	.10	SI
15	P			<	.03700	<	.13627	.00000+-	.00464	.00+-	.13	P
16	S	*		.56740+-	.06620	2.01452+-	.31084	.63349+-	.04983	1.12+-	.16	S
17	CL			<	.00350	<	.01744	.00000+-	.00200	.00+-	.57	CL
19	K	*		.82580+-	.09290	2.93196+-	.44321	.67213+-	.06719	.81+-	.12	K
20	CA	*		.95810+-	.10760	3.40168+-	.51373	.83772+-	.06399	.87+-	.12	CA
22	TI	*		.10030+-	.02250	.35611+-	.08760	.18981+-	.01898	1.89+-	.46	TI
23	V			.00710+-	.00710	.02521+-	.02534	.00276+-	.00160	.39+-	.45	V
24	CR			<	.00000	<	.00178	.00097+-	.00036	.00+-	.00	CR
25	MN	*		.01250+-	.00150	.04438+-	.00696	.01602+-	.00160	1.28+-	.20	MN
26	FE	*		1.10380+-	.12380	3.91898+-	.59142	1.08835+-	.10877	.99+-	.15	FE
28	NI			.00400+-	.00400	.01420+-	.01427	.00204+-	.00203	.51+-	.72	NI
29	CU			.78880+-	.08860	2.80059+-	.42299	.15684+-	.01566	.20+-	.03	CU
30	ZN	*		.01440+-	.00440	.05113+-	.01645	.01413+-	.00122	.98+-	.31	ZN
31	GA			.00250+-	.00250	.00888+-	.00892	.00000+-	.00012	.00+-	.05	GA
33	AS	*		.00680+-	.00190	.02414+-	.00717	.00699+-	.00072	1.03+-	.31	AS
34	SE			<	.00010	<	.00107	.00000+-	.00009	.00+-	.94	SE
35	BR	*		.00060+-	.00030	.00213+-	.00109	.00048+-	.00074	.79+-	1.30	BR
37	RB			.00190+-	.00050	.00675+-	.00190	.00365+-	.00036	1.92+-	.54	RB
38	SR			.00570+-	.00080	.02024+-	.00350	.00394+-	.00040	.69+-	.12	SR
39	Y			.00100+-	.00060	.00355+-	.00216	.00089+-	.00023	.89+-	.58	Y
40	ZR			<	.00000	<	.01136	.00000+-	.00086	.00+-	.00	ZR
42	MO			.01130+-	.00200	.04012+-	.00818	.00545+-	.00065	.48+-	.10	MO
46	PD			<	.00000	<	.00568	.00000+-	.00049	.00+-	.00	PD
47	AG			<	.00000	<	.00781	.00001+-	.00067	.00+-	.00	AG
48	CD			<	.00000	<	.00994	.00055+-	.00086	.00+-	.00	CD
49	IN			<	.00000	<	.01243	.00002+-	.00106	.00+-	.00	IN
50	SN			<	.00000	<	.01562	.00026+-	.00120	.00+-	.00	SN
51	SB			<	.00000	<	.03373	.00052+-	.00276	.00+-	.00	SB
56	BA			<	.00000	<	.06284	.00000+-	.00528	.00+-	.00	BA
57	LA			<	.00000	<	.11361	.00000+-	.00905	.00+-	.00	LA
80	HG			.00060+-	.00060	.00213+-	.00214	.00000+-	.00013	.00+-	.21	HG
82	PB		*	.00870+-	.00210	.03089+-	.00808	.00856+-	.00080	.98+-	.25	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 6.2+- .7 COARSE: 28.2+- 2.8 TOTAL: 34.4+- 2.9

RESULTS FOR CMB SITE: MD 76' 76C YEAR: 87 DATE: [illegible]
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9328
CHI SQUARE: 2.9141
DF: 9

#	TYPE	UG/M3		%	
5	5095	1.711+-	.254	4.980+-	.855
7	GYPSU	2.793+-	.352	8.132+-	1.240
23	SLPR#	.035+-	.007	.102+-	.022
24	SLPR2	.328+-	.033	.956+-	.127
28	DUSTO	20.501+-	1.271	59.683+-	6.308
	TOTAL:	25.368+-	1.280	73.852+-	7.338

	SPECIES	INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			34.35020+-	2.94007	100.00000+-	12.10438	25.36845+-	1.28045	.74+-	.07	TOTAL
13	AL	*		1.82840+-	.21345	5.32282+-	.77052	1.43331+-	.12913	.78+-	.12	AL
14	SI	*		8.52180+-	.86978	24.80859+-	3.30459	5.46179+-	.49342	.64+-	.09	SI
15	P			.04720+-	.03956	.13741+-	.11578	.00057+-	.00483	.01+-	.10	P
16	S	*		1.04400+-	.08723	3.03928+-	.36353	1.11009+-	.05382	1.06+-	.10	S
17	CL			.01680+-	.00679	.04891+-	.02020	.00000+-	.00252	.00+-	.15	CL
19	K	*		.91950+-	.09355	2.67684+-	.35590	.71892+-	.06735	.78+-	.11	K
20	CA	*		1.04000+-	.10802	3.02764+-	.40748	.91962+-	.06436	.88+-	.11	CA
22	TI	*		.10660+-	.02252	.31033+-	.07074	.19896+-	.01901	1.87+-	.43	TI
23	V			<	.00710	<	.02078	.00289+-	.00160	.41+-	.47	V
24	CR			.00130+-	.00064	.00378+-	.00189	.00102+-	.00037	.79+-	.48	CR
25	MN	*		.01320+-	.00158	.03843+-	.00566	.01727+-	.00160	1.31+-	.20	MN
26	FE	*		1.17720+-	.12409	3.42705+-	.46534	1.16307+-	.10902	.99+-	.14	FE
28	NI			.00460+-	.00402	.01339+-	.01176	.00220+-	.00205	.48+-	.61	NI
29	CU			.93570+-	.09012	2.72400+-	.35099	.16750+-	.01569	.18+-	.02	CU
30	ZN	*		.06990+-	.00777	.20349+-	.02854	.07274+-	.00594	1.04+-	.14	ZN
31	GA			.00270+-	.00257	.00786+-	.00751	.00000+-	.00032	.00+-	.12	GA
33	AS	*		.03470+-	.00822	.10102+-	.02545	.05049+-	.00600	1.46+-	.39	AS
34	SE			.01000+-	.00124	.02911+-	.00438	.00000+-	.00039	.00+-	.04	SE
35	BR	*		.00180+-	.00095	.00524+-	.00280	.00048+-	.00342	.26+-	1.90	BR
37	RB			.00190+-	.00078	.00553+-	.00232	.00380+-	.00037	2.00+-	.85	RB
38	SR			.00570+-	.00106	.01659+-	.00340	.00419+-	.00040	.74+-	.15	SR
39	Y			<	.00100	<	.00316	.00126+-	.00040	1.26+-	1.42	Y
40	ZR			<	.00000	<	.01446	.00003+-	.00089	.00+-	.00	ZR
42	MO			.01130+-	.00305	.03290+-	.00931	.00648+-	.00066	.57+-	.17	MO
46	PD			<	.00000	<	.00816	.00000+-	.00051	.00+-	.00	PD
47	AG			<	.00000	<	.01107	.00001+-	.00068	.00+-	.00	AG
48	CD			.01540+-	.00539	.04483+-	.01614	.00563+-	.00103	.37+-	.14	CD
49	IN			<	.00000	<	.01777	.00002+-	.00110	.00+-	.00	IN
50	SN			<	.00000	<	.02166	.00279+-	.00127	.00+-	.00	SN
51	SB			<	.00000	<	.04758	.00558+-	.00289	.00+-	.00	SB
56	BA			<	.00000	<	.08728	.00000+-	.00542	.00+-	.00	BA
57	LA			<	.00000	<	.16122	.00000+-	.00936	.00+-	.00	LA
80	HG			.00090+-	.00078	.00262+-	.00228	.00000+-	.00038	.00+-	.42	HG
82	PB	*		.13740+-	.01475	.40000+-	.05492	.10940+-	.01010	.80+-	.11	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 6.2+- .7 COARSE: 28.2+- 2.8 TOTAL: 34.4+- 2.9

RESULTS FOR CMB SITE: GR 763 762 YEAR: 87 DATE: 0111
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9312
CHI SQUARE: 3.7694
DF: 8

#	TYPE	UG/M3		%	
5	5095	2.026+-	.282	29.949+-	5.449
13	KNECT	.326+-	.081	4.814+-	1.322
20	2NCD1	.935+-	.099	13.821+-	2.179
28	DUSTO	1.907+-	.160	28.193+-	4.055
	TOTAL:	5.194+-	.328	76.777+-	10.206

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			6.76510+-	.79130	100.00000+-	16.54177	5.19405+-	.32810	.77+-	.10	TOTAL
13	AL	*		.21510+-	.02830	3.17955+-	.55974	.21489+-	.01933	1.00+-	.16	AL
14	SI	*		1.00520+-	.11440	14.85861+-	2.42491	.77542+-	.07143	.77+-	.11	SI
15	P			<	.00000	<	.04730	.00103+-	.00139	.00+-	.00	P
16	S	*		.50850+-	.06160	7.51652+-	1.26574	.50850+-	.02820	1.00+-	.13	S
17	CL			.00580+-	.00470	.08573+-	.07019	.00061+-	.00303	.10+-	.53	CL
19	K	*		.11310+-	.01310	1.67182+-	.27520	.06184+-	.00584	.55+-	.08	K
20	CA	*		.07030+-	.00820	1.03916+-	.17166	.06896+-	.00518	.98+-	.14	CA
22	TI	*		.00810+-	.00120	.11973+-	.02260	.01244+-	.00117	1.54+-	.27	TI
23	V			.00080+-	.00040	.01183+-	.00607	.00024+-	.00016	.30+-	.25	V
24	CR			.00130+-	.00040	.01922+-	.00633	.00012+-	.00008	.09+-	.07	CR
25	MN	*		.00140+-	.00050	.02069+-	.00778	.00188+-	.00017	1.34+-	.49	MN
26	FE	*		.09890+-	.01130	1.46191+-	.23904	.10522+-	.00953	1.06+-	.16	FE
28	NI			.00130+-	.00040	.01922+-	.00633	.00024+-	.00021	.18+-	.17	NI
29	CU			.22090+-	.02480	3.26529+-	.52940	.01951+-	.00140	.09+-	.01	CU
30	ZN	*		.07770+-	.00890	1.14854+-	.18803	.05693+-	.00562	.73+-	.11	ZN
31	GA			<	.00000	<	.01183	.00001+-	.00007	.00+-	.00	GA
33	AS	*		.02960+-	.01070	.43754+-	.16624	.05214+-	.01151	1.76+-	.75	AS
34	SE			.03360+-	.00390	.49667+-	.08184	.00001+-	.00082	.00+-	.02	SE
35	BR	*		.00150+-	.00110	.02217+-	.01647	.00001+-	.00424	.01+-	2.83	BR
37	RB			<	.00000	<	.00739	.00022+-	.00009	.00+-	.00	RB
38	SR			<	.00000	<	.00887	.00042+-	.00008	.00+-	.00	SR
39	Y			<	.00000	<	.01478	.00043+-	.00065	.00+-	.00	Y
40	ZR			<	.00000	<	.05321	.00012+-	.00033	.00+-	.00	ZR
42	MO			.00220+-	.00220	.03252+-	.03274	.00037+-	.00015	.17+-	.18	MO
46	PD			<	.00000	<	.03252	.00004+-	.00016	.00+-	.00	PD
47	AG			<	.00000	<	.04287	.00038+-	.00019	.00+-	.00	AG
48	CD			.01620+-	.00450	.23946+-	.07217	.00227+-	.00035	.14+-	.04	CD
49	IN			<	.00000	<	.06947	.00034+-	.00034	.00+-	.00	IN
50	SN			<	.00000	<	.08426	.00231+-	.00046	.00+-	.00	SN
51	SB			<	.00000	<	.18921	.00721+-	.00112	.00+-	.00	SB
56	BA			<	.00000	<	.34294	.00017+-	.00157	.00+-	.00	BA
57	LA			<	.00000	<	.61492	.00083+-	.00309	.00+-	.00	LA
80	HG			<	.00000	<	.00739	.00001+-	.00034	.00+-	.00	HG
82	PB	*		.18060+-	.02040	2.66958+-	.43409	.20429+-	.02040	1.13+-	.17	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 6.8+- .8 COARSE: 120.0+-12.0 TOTAL: 126.8+-12.0

RESULTS FOR CME SITE [illegible] YEAR [illegible] DATE [illegible]
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9263
CHI SQUARE: 3.8578
DF: 9

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
13	KNECT	.000+-	.000	.000+-	.000
14	CU OR	31.969+-	7.261	26.639+-	6.612
20	2NCD1	.000+-	.000	.000+-	.000
24	SLPR2	.077+-	.014	.064+-	.013
28	DUSTO	48.156+-	6.833	40.128+-	6.968
	TOTAL:	80.203+-	4.200	66.831+-	7.550

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			120.00820+-	12.01270	100.00000+-	14.15613	80.20283+-	4.20033	.67+-	.08	TOTAL
13	AL	*		7.12020+-	.87310	5.93309+-	.93916	6.53512+-	.46207	.92+-	.13	AL
14	SI	*		31.43920+-	3.51820	26.19754+-	3.93334	19.88139+-	1.44892	.63+-	.08	SI
15	P			<	.13160	<	.11079	.03402+-	.01360	.26+-	.28	P
16	S	*		.94050+-	.10810	.78370+-	.11945	.97793+-	.07005	1.04+-	.14	S
17	CL			<	.00860	<	.00770	.02941+-	.00586	3.42+-	3.72	CL
19	K	*		4.67250+-	.52330	3.89348+-	.58484	2.96005+-	.21165	.63+-	.08	K
20	CA	*		.92590+-	.10610	.77153+-	.11739	.72788+-	.06357	.79+-	.11	CA
22	TI	*		.50530+-	.11320	.42105+-	.10331	.62055+-	.05009	1.23+-	.29	TI
23	V			<	.03120	<	.02629	.01453+-	.00449	.47+-	.49	V
24	CR			<	.00000	<	.00108	.01090+-	.00124	.00+-	.00	CR
25	MN	*		.04040+-	.00460	.03366+-	.00510	.05170+-	.00420	1.28+-	.18	MN
26	FE	*		3.45420+-	.38710	2.87830+-	.43250	4.81128+-	.34372	1.39+-	.19	FE
28	NI			.00220+-	.00080	.00183+-	.00069	.00678+-	.00516	3.08+-	2.60	NI
29	CU			1.10960+-	.12480	.92460+-	.13921	.43659+-	.03988	.39+-	.06	CU
30	ZN	*		.04130+-	.00740	.03441+-	.00706	.03149+-	.00261	.76+-	.15	ZN
31	GA			<	.00580	<	.00494	.00096+-	.00033	.17+-	.18	GA
33	AS	*		.00890+-	.00340	.00742+-	.00293	.01141+-	.00181	1.28+-	.53	AS
34	SE			.00190+-	.00060	.00158+-	.00052	.00048+-	.00024	.25+-	.15	SE
35	BR	*	-	<	.00000	<	.00042	.00194+-	.00152	.00+-	.00	BR
37	RB			.02110+-	.00250	.01758+-	.00273	.01727+-	.00121	.82+-	.11	RB
38	SR			.02980+-	.00350	.02483+-	.00383	.01812+-	.00131	.61+-	.08	SR
39	Y			.01040+-	.00150	.00867+-	.00152	.00554+-	.00067	.53+-	.10	Y
40	ZR			.00610+-	.00490	.00508+-	.00411	.00275+-	.00247	.45+-	.54	ZR
42	MO			.02480+-	.00370	.02067+-	.00371	.01369+-	.00181	.55+-	.11	MO
46	PD			<	.00000	<	.00192	.00096+-	.00141	.00+-	.00	PD
47	AG			<	.00000	<	.00250	.00000+-	.00189	.00+-	.00	AG
48	CD			<	.00000	<	.00342	.00104+-	.00246	.00+-	.00	CD
49	IN			<	.00000	<	.00400	.00225+-	.00301	.00+-	.00	IN
50	SN			<	.00000	<	.00467	.00055+-	.00344	.00+-	.00	SN
51	SB			<	.00000	<	.01042	.00448+-	.00782	.00+-	.00	SB
56	BA			<	.00000	<	.02008	.00000+-	.01512	.00+-	.00	BA
57	LA			<	.00000	<	.03541	.02107+-	.02581	.00+-	.00	LA
80	HG			<	.00000	<	.00033	.00045+-	.00034	.00+-	.00	HG
82	PB	*		.03260+-	.00470	.02716+-	.00477	.03322+-	.00262	1.02+-	.17	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 6.8+- .8 COARSE: 120.0+-12.0 TOTAL: 126.8+-12.0

RESULTS FOR CMB SITE: GR 763 762 YEAR: 87 DATE: 0111
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9263
CHI SQUARE: 3.8578
DF: 9

#	TYPE	UG/M3		%	
5	5095	2.026+-	.282	1.598+-	.270
13	KNECT	.326+-	.081	.257+-	.068
14	CU OR	31.969+-	7.261	25.218+-	6.208
20	2NCD1	.935+-	.099	.738+-	.105
24	SLPR2	.077+-	.014	.061+-	.013
28	DUSTO	50.064+-	6.835	39.491+-	6.567
	TOTAL:	85.397+-	4.213	67.362+-	7.209

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			126.77330+-	12.03873	100.00000+-	13.42975	85.39687+-	4.21312	.67+-	.07	TOTAL
13	AL		*	7.33530+-	.87356	5.78616+-	.88133	6.75001+-	.46248	.92+-	.13	AL
14	SI		*	32.44440+-	3.52006	25.59245+-	3.69003	20.65681+-	1.45068	.64+-	.08	SI
15	P			<	.13160	<	.10485	.03504+-	.01367	.27+-	.29	P
16	S		*	1.44900+-	.12442	1.14299+-	.14633	1.48643+-	.07551	1.03+-	.10	S
17	CL			.01440+-	.01033	.01136+-	.00822	.03002+-	.00660	2.08+-	1.56	CL
19	K		*	4.78560+-	.52346	3.77493+-	.54681	3.02189+-	.21173	.63+-	.08	K
20	CA		*	.99620+-	.10642	.78581+-	.11232	.79684+-	.06378	.80+-	.11	CA
22	TI		*	.51340+-	.11321	.40497+-	.09723	.63299+-	.05010	1.23+-	.29	TI
23	V			.03200+-	.03140	.02524+-	.02489	.01477+-	.00449	.46+-	.47	V
24	CR			<	.00130	<	.00108	.01101+-	.00124	8.47+-	8.91	CR
25	MN		*	.04180+-	.00463	.03297+-	.00481	.05358+-	.00420	1.28+-	.17	MN
26	FE		*	3.55310+-	.38726	2.80272+-	.40516	4.91650+-	.34386	1.38+-	.18	FE
28	NI			.00350+-	.00089	.00276+-	.00075	.00702+-	.00516	2.01+-	1.56	NI
29	CU			1.33050+-	.12724	1.04951+-	.14145	.45610+-	.03990	.34+-	.04	CU
30	ZN		*	.11900+-	.01157	.09387+-	.01276	.08841+-	.00620	.74+-	.09	ZN
31	GA			<	.00580	<	.00472	.00097+-	.00034	.17+-	.18	GA
33	AS		*	.03850+-	.01123	.03037+-	.00931	.06354+-	.01165	1.65+-	.57	AS
34	SE			.03550+-	.00395	.02800+-	.00409	.00049+-	.00086	.01+-	.02	SE
35	BR		*	.00150+-	.00121	.00118+-	.00096	.00195+-	.00450	1.30+-	3.18	BR
37	RB			.02110+-	.00255	.01664+-	.00256	.01749+-	.00122	.83+-	.12	RB
38	SR			.02980+-	.00355	.02351+-	.00358	.01854+-	.00131	.62+-	.09	SR
39	Y			.01040+-	.00180	.00820+-	.00162	.00597+-	.00093	.57+-	.13	Y
40	ZR			.00610+-	.00608	.00481+-	.00482	.00287+-	.00249	.47+-	.62	ZR
42	MO			.02700+-	.00430	.02130+-	.00395	.01406+-	.00181	.52+-	.11	MO
46	PD			<	.00000	<	.00251	.00100+-	.00141	.00+-	.00	PD
47	AG			<	.00000	<	.00329	.00038+-	.00190	.00+-	.00	AG
48	CD			.01620+-	.00609	.01278+-	.00495	.00331+-	.00248	.20+-	.17	CD
49	IN			<	.00000	<	.00530	.00259+-	.00303	.00+-	.00	IN
50	SN			<	.00000	<	.00630	.00287+-	.00348	.00+-	.00	SN
51	SB			<	.00000	<	.01411	.01170+-	.00790	.00+-	.00	SB
56	BA			<	.00000	<	.02639	.00017+-	.01520	.00+-	.00	BA
57	LA			<	.00000	<	.04691	.02190+-	.02599	.00+-	.00	LA
80	HG			<	.00000	<	.00051	.00046+-	.00048	.00+-	.00	HG
82	PB		*	.21320+-	.02093	.16817+-	.02297	.23751+-	.02057	1.11+-	.15	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 6.8+- .8 COARSE: 120.0+-12.0 TOTAL: 126.8+-12.0

RESULTS FOR CMB SITE: OR 767 768 YEAR: 87 DATE: [illegible]
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .8188
CHI SQUARE: 9.4338
DF: 9

#	TYPE	UG/M3		%	
5	5D95	2.456+-	.337	15.581+-	2.677
21	2NCD2	.720+-	.071	4.565+-	.652
28	DUSTD	4.601+-	.315	29.193+-	3.620
	TOTAL:	7.776+-	.457	49.339+-	5.866

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			15.76110+-	1.62910	100.00000+-	14.61761	7.77630+-	.45700	.49+-	.06	TOTAL
13	AL		*	.48320+-	.06420	3.06578+-	.51608	.46276+-	.04628	.96+-	.16	AL
14	SI		*	3.98070+-	.45030	25.25649+-	3.87010	1.71447+-	.17147	.43+-	.07	SI
15	P			<	.00000	<	.03807	.00176+-	.00198	.00+-	.00	P
16	S		*	.63750+-	.07490	4.04477+-	.63295	.63750+-	.03036	1.00+-	.13	S
17	CL			.34420+-	.03960	2.18386+-	.33776	.00000+-	.00277	.00+-	.01	CL
19	K		*	.33460+-	.03790	2.12295+-	.32554	.14180+-	.01407	.42+-	.06	K
20	CA		*	.09860+-	.01150	.62559+-	.09749	.06459+-	.00681	.66+-	.10	CA
22	TI		*	.02060+-	.00250	.13070+-	.02084	.02807+-	.00281	1.36+-	.21	TI
23	V			.00060+-	.00060	.00381+-	.00383	.00040+-	.00038	.67+-	.92	V
24	CR			<	.00000	<	.00317	.00017+-	.00013	.00+-	.00	CR
25	MN		*	<	.00000	<	.00381	.00384+-	.00039	.00+-	.00	MN
26	FE		*	.21850+-	.02470	1.38632+-	.21235	.22895+-	.02286	1.05+-	.16	FE
28	NI			.00090+-	.00040	.00571+-	.00261	.00051+-	.00051	.56+-	.62	NI
29	CU			.17430+-	.01960	1.10589+-	.16891	.03619+-	.00323	.21+-	.03	CU
30	ZN		*	.06530+-	.00750	.41431+-	.06402	.06472+-	.00633	.99+-	.15	ZN
31	GA			.00150+-	.00080	.00952+-	.00517	.00035+-	.00059	.23+-	.41	GA
33	AS		*	.07010+-	.01250	.44477+-	.09167	.06516+-	.01036	.93+-	.22	AS
34	SE			.02460+-	.00290	.15608+-	.02447	.00000+-	.00065	.00+-	.03	SE
35	BR		*	.00300+-	.00150	.01903+-	.00972	.00000+-	.00506	.00+-	1.69	BR
37	RB			<	.00000	<	.00317	.00047+-	.00013	.00+-	.00	RB
38	SR			.00260+-	.00080	.01650+-	.00535	.00078+-	.00013	.30+-	.11	SR
39	Y			<	.00000	<	.00634	.00063+-	.00058	.00+-	.00	Y
40	ZR			<	.00000	<	.02221	.00014+-	.00065	.00+-	.00	ZR
42	MO			<	.00000	<	.01586	.00049+-	.00036	.00+-	.00	MO
46	PD			<	.00000	<	.01459	.00000+-	.00038	.00+-	.00	PD
47	AG			<	.00000	<	.01903	.00043+-	.00043	.00+-	.00	AG
48	CD			<	.00000	<	.02411	.00713+-	.00095	.00+-	.00	CD
49	IN			<	.00000	<	.03045	.00025+-	.00080	.00+-	.00	IN
50	SN			<	.00000	<	.03616	.00257+-	.00098	.00+-	.00	SN
51	SB			<	.00000	<	.08058	.01063+-	.00230	.00+-	.00	SB
56	BA			<	.00000	<	.14783	.00000+-	.00372	.00+-	.00	BA
57	LA			<	.00000	<	.27282	.00000+-	.00734	.00+-	.00	LA
80	HG			<	.00000	<	.00254	.00000+-	.00034	.00+-	.00	HG
82	PB		*	.17270+-	.01950	1.09574+-	.16773	.17944+-	.01790	1.04+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 15.8+- 1.6 COARSE: 95.4+- 9.5 TOTAL: 111.1+- 9.7

RESULTS FOR CMB SITE: GR 767 768 YEAR: 87 DATE: 0112
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9347
CHI SQUARE: 3.8417
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
6	CAO	.632+-	.193	.663+-	.213
14	CU OR	37.075+-	6.879	38.882+-	8.196
19	SSFF2	.208+-	.037	.218+-	.045
21	2NCD2	.000+-	.000	.000+-	.000
28	DUSTO	27.070+-	6.541	28.389+-	7.424
	TOTAL:	64.985+-	3.544	68.151+-	7.766

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			95.35460+-	9.54050	100.00000+-	14.14961	64.98547+-	3.54407	.68+-	.08	TOTAL
13	AL		*	5.53060+-	.68270	5.80003+-	.92161	5.63630+-	.42247	1.02+-	.15	AL
14	SI		*	27.03740+-	3.03080	28.35458+-	4.26039	15.63815+-	1.11145	.58+-	.08	SI
15	P			<	.10780	<	.11414	.03945+-	.01038	.37+-	.38	P
16	S		*	.89170+-	.10300	.93514+-	.14291	.88799+-	.07092	1.00+-	.14	S
17	CL			<	.00000	<	.01007	.03411+-	.00455	.00+-	.00	CL
19	K		*	3.50750+-	.39320	3.67838+-	.55271	2.41627+-	.17440	.69+-	.09	K
20	CA		*	.91640+-	.10410	.96104+-	.14548	.91640+-	.05837	1.00+-	.13	CA
22	TI		*	.33020+-	.07420	.34629+-	.08518	.43220+-	.03151	1.31+-	.31	TI
23	V			<	.00990	<	.01054	.01267+-	.00321	1.28+-	1.33	V
24	CR			<	.00000	<	.00126	.01117+-	.00110	.00+-	.00	CR
25	MN		*	.03500+-	.00400	.03671+-	.00558	.03577+-	.00262	1.02+-	.14	MN
26	FE		*	2.90280+-	.32550	3.04422+-	.45749	3.95175+-	.28412	1.36+-	.18	FE
28	NI			.00200+-	.00080	.00210+-	.00086	.00479+-	.00292	2.39+-	1.75	NI
29	CU			1.02550+-	.11520	1.07546+-	.16178	.29650+-	.02293	.29+-	.04	CU
30	ZN		*	.05080+-	.00780	.05327+-	.00976	.03632+-	.00428	.71+-	.14	ZN
31	GA			<	.00000	<	.00052	.00104+-	.00042	.00+-	.00	GA
33	AS		*	.02000+-	.00400	.02097+-	.00469	.01971+-	.00446	.99+-	.30	AS
34	SE			<	.00000	<	.00052	.00056+-	.00055	.00+-	.00	SE
35	BR		*	<	.00000	<	.00052	.00153+-	.00380	.00+-	.00	BR
37	RB			.01350+-	.00170	.01416+-	.00228	.01450+-	.00106	1.07+-	.16	RB
38	SR			.03040+-	.00360	.03188+-	.00494	.01506+-	.00112	.50+-	.07	SR
39	Y			.00610+-	.00120	.00640+-	.00141	.00502+-	.00053	.82+-	.18	Y
40	ZR			<	.00000	<	.00451	.00319+-	.00185	.00+-	.00	ZR
42	MO			.03070+-	.00410	.03220+-	.00537	.00828+-	.00128	.27+-	.06	MO
46	PD			<	.00000	<	.00210	.00111+-	.00102	.00+-	.00	PD
47	AG			<	.00000	<	.00283	.00000+-	.00138	.00+-	.00	AG
48	CD			<	.00000	<	.00367	.00094+-	.00185	.00+-	.00	CD
49	IN			<	.00000	<	.00461	.00304+-	.00218	.00+-	.00	IN
50	SN			<	.00000	<	.00545	.00104+-	.00257	.00+-	.00	SN
51	SB			<	.00000	<	.01185	.00557+-	.00572	.00+-	.00	SB
56	BA			<	.00000	<	.02318	.00000+-	.01110	.00+-	.00	BA
57	LA			<	.00000	<	.03975	.02443+-	.01885	.00+-	.00	LA
80	HG			<	.00000	<	.00042	.00052+-	.00041	.00+-	.00	HG
82	PB		*	.02170+-	.00390	.02276+-	.00468	.02804+-	.00345	1.29+-	.28	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 15.8+- 1.6 COARSE: 95.4+- 9.5 TOTAL: 111.1+- 9.7

RESULTS FOR THE SITE: OR 76? YEAR: 87 DATE: 0??2
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9347
CHI SQUARE: 3.8417
DF: 8

#	TYPE	UG/M3		%	
5	5095	2.456+-	.337	2.210+-	.359
6	CAO	.632+-	.193	.569+-	.181
14	CU OR	37.075+-	6.879	33.367+-	6.839
19	SSFF2	.208+-	.037	.187+-	.037
21	2NCD2	.720+-	.071	.648+-	.085
28	DUSTO	31.671+-	6.549	28.503+-	6.395
	TOTAL:	72.762+-	3.573	65.483+-	6.548

SPECIES		INCL	MISS FLG	TOTAL MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			111.11570+-	9.67859	100.00000+-	12.31833	72.76176+-	3.57341	.65+-	.07	TOTAL
13	AL		*	6.01380+-	.68571	5.41220+-	.77658	6.09907+-	.42499	1.01+-	.14	AL
14	SI		*	31.01810+-	3.06407	27.91514+-	3.67646	17.35262+-	1.12460	.56+-	.07	SI
15	P			<	.10780	<	.09798	.04121+-	.01057	.38+-	.40	P
16	S		*	1.52920+-	.12735	1.37622+-	.16585	1.52549+-	.07714	1.00+-	.10	S
17	CL			.34420+-	.04075	.30977+-	.04553	.03411+-	.00533	.10+-	.02	CL
19	K		*	3.84210+-	.39502	3.45775+-	.46593	2.55807+-	.17496	.67+-	.08	K
20	CA		*	1.01500+-	.10473	.91346+-	.12335	.98099+-	.05877	.97+-	.12	CA
22	TI		*	.35080+-	.07424	.31571+-	.07225	.46027+-	.03163	1.31+-	.29	TI
23	V			.01050+-	.01002	.00945+-	.00905	.01308+-	.00323	1.25+-	1.23	V
24	CR			<	.00000	<	.00117	.01133+-	.00111	.00+-	.00	CR
25	MN		*	.03500+-	.00404	.03150+-	.00456	.03961+-	.00265	1.13+-	.15	MN
26	FE		*	3.12130+-	.32644	2.80905+-	.38233	4.18070+-	.28503	1.34+-	.17	FE
28	NI			.00290+-	.00089	.00261+-	.00084	.00529+-	.00297	1.83+-	1.17	NI
29	CU			1.19980+-	.11686	1.07978+-	.14109	.33269+-	.02316	.28+-	.03	CU
30	ZN		*	.11610+-	.01082	.10449+-	.01333	.10104+-	.00764	.87+-	.10	ZN
31	GA			.00150+-	.00094	.00135+-	.00086	.00139+-	.00072	.93+-	.75	GA
33	AS		*	.09010+-	.01312	.08109+-	.01376	.08487+-	.01128	.94+-	.19	AS
34	SE			.02460+-	.00294	.02214+-	.00328	.00056+-	.00085	.02+-	.03	SE
35	BR		*	.00300+-	.00158	.00270+-	.00144	.00153+-	.00633	.51+-	2.13	BR
37	RB			.01350+-	.00177	.01215+-	.00191	.01498+-	.00107	1.11+-	.17	RB
38	SR			.03300+-	.00369	.02970+-	.00421	.01584+-	.00113	.48+-	.06	SR
39	Y			.00610+-	.00156	.00549+-	.00148	.00564+-	.00079	.92+-	.27	Y
40	ZR			<	.00000	<	.00499	.00332+-	.00196	.00+-	.00	ZR
42	MO			.03070+-	.00480	.02763+-	.00495	.00877+-	.00133	.29+-	.06	MO
46	PD			<	.00000	<	.00274	.00111+-	.00109	.00+-	.00	PD
47	AG			<	.00000	<	.00363	.00043+-	.00145	.00+-	.00	AG
48	CD			<	.00000	<	.00465	.00808+-	.00208	.00+-	.00	CD
49	IN			<	.00000	<	.00586	.00329+-	.00232	.00+-	.00	IN
50	SN			<	.00000	<	.00694	.00361+-	.00275	.00+-	.00	SN
51	SB			<	.00000	<	.01530	.01620+-	.00616	.00+-	.00	SB
56	BA			<	.00000	<	.02890	.00000+-	.01171	.00+-	.00	BA
57	LA			<	.00000	<	.05158	.02443+-	.02023	.00+-	.00	LA
80	HG			<	.00000	<	.00051	.00052+-	.00053	.00+-	.00	HG
82	PB		*	.19440+-	.01989	.17495+-	.02351	.20748+-	.01823	1.07+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 15.8+- 1.6 COARSE: 95.4+- 9.5 TOTAL: 111.1+- 9.7

RESULTS FOR CMB SITE: HD 783 784 YEAR: 87 DATE: 0127
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9826
CHI SQUARE: 1.1858
DF: 7

#	TYPE	UG/M3		%	
5	5095	1.249+-	.453	11.657+-	4.408
7	GYPSU	1.501+-	.252	14.012+-	2.789
21	2NCD2	.474+-	.064	4.420+-	.761
26	CHORM	.781+-	.234	7.291+-	2.322
28	DUSTO	4.137+-	.313	38.612+-	5.070
	TOTAL:	8.142+-	.482	75.992+-	9.315

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			10.71430+-	1.14990	100.00000+-	15.17789	8.14200+-	.48208	.76+-	.09	TOTAL
13	AL		*	.37010+-	.04780	3.45426+-	.58006	.42444+-	.04162	1.15+-	.19	AL
14	SI		*	1.52410+-	.17400	14.22491+-	2.22892	1.58178+-	.15422	1.04+-	.16	SI
15	P			<	.00000	<	.04480	.00158+-	.00175	.00+-	.00	P
16	S		*	.73910+-	.08520	6.89826+-	1.08649	.73910+-	.03491	1.00+-	.12	S
17	CL			.04150+-	.00670	.38733+-	.07509	.00000+-	.00191	.00+-	.05	CL
19	K		*	.12820+-	.01480	1.19653+-	.18860	.13022+-	.01266	1.02+-	.15	K
20	CA		*	.41270+-	.04650	3.85186+-	.59938	.41270+-	.03549	1.00+-	.14	CA
22	TI		*	.03380+-	.00400	.31547+-	.05040	.02592+-	.00253	.77+-	.12	TI
23	V			<	.00040	<	.00561	.00042+-	.00035	1.06+-	1.80	V
24	CR			<	.00000	<	.00373	.00043+-	.00012	.00+-	.00	CR
25	MN		*	.00300+-	.00070	.02800+-	.00719	.00379+-	.00035	1.26+-	.32	MN
26	FE		*	.35640+-	.04010	3.32640+-	.51723	.31856+-	.02345	.89+-	.12	FE
28	NI			.00040+-	.00040	.00373+-	.00375	.00137+-	.00102	3.42+-	4.27	NI
29	CU			.29130+-	.03270	2.71880+-	.42224	.21100+-	.01818	.72+-	.10	CU
30	ZN		*	.06670+-	.00770	.62253+-	.09813	.07268+-	.00512	1.09+-	.15	ZN
31	GA			<	.00040	<	.00468	.00023+-	.00039	.58+-	1.22	GA
33	AS		*	.06370+-	.00990	.59453+-	.11229	.04724+-	.00684	.74+-	.16	AS
34	SE			.01060+-	.00130	.09893+-	.01612	.00011+-	.00044	.01+-	.04	SE
35	BR		*	.00320+-	.00120	.02987+-	.01165	.00033+-	.00333	.10+-	1.04	BR
37	RB			<	.00000	<	.00467	.00045+-	.00010	.00+-	.00	RB
38	SR			.00080+-	.00060	.00747+-	.00566	.00075+-	.00012	.94+-	.72	SR
39	Y			<	.00000	<	.00747	.00050+-	.00039	.00+-	.00	Y
40	ZR			<	.00000	<	.02707	.00009+-	.00058	.00+-	.00	ZR
42	MO			<	.00000	<	.01867	.00166+-	.00035	.00+-	.00	MO
46	PD			<	.00000	<	.01773	.00000+-	.00035	.00+-	.00	PD
47	AG			<	.00000	<	.02240	.00028+-	.00040	.00+-	.00	AG
48	CD			.00390+-	.00330	.03640+-	.03105	.00469+-	.00075	1.20+-	1.04	CD
49	IN			<	.00000	<	.03733	.00017+-	.00073	.00+-	.00	IN
50	SN			<	.00000	<	.04573	.00169+-	.00088	.00+-	.00	SN
51	SB			<	.00000	<	.09800	.00700+-	.00197	.00+-	.00	SB
56	BA			<	.00000	<	.18573	.00000+-	.00341	.00+-	.00	BA
57	LA			<	.00000	<	.33040	.00000+-	.00671	.00+-	.00	LA
80	HG			<	.00020	<	.00374	.00000+-	.00023	.00+-	1.15	HG
82	PB		*	.11880+-	.01350	1.10880+-	.17331	.12417+-	.01180	1.05+-	.15	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.7+- 1.1 COARSE: 46.2+- 4.6 TOTAL: 56.9+- 4.8

RESULTS FOR CHE SITE: HD 783 75- YEAR: 87 DATE: 0127
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9573
CHI SQUARE: 2.8227
DF: 7

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	5.405+-	1.116	11.705+-	2.687
13	KNECT	28.893+-	4.557	62.566+-	11.701
21	2NCD2	.000+-	.000	.000+-	.000
22	2NCD3	.144+-	.035	.313+-	.082
26	CHORM	1.137+-	.309	2.463+-	.713
28	DUSTO	13.743+-	2.641	29.760+-	6.454
	TOTAL:	49.322+-	2.894	106.805+-	12.429

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			46.17940+-	4.64040	100.00000+-	14.21092	49.32214+-	2.89432	1.07+-	.12	TOTAL
13	AL		*	1.82820+-	.23580	3.95891+-	.64729	2.38225+-	.17191	1.30+-	.19	AL
14	SI		*	8.67890+-	.97470	18.79388+-	2.83223	8.09605+-	.57373	.93+-	.12	SI
15	P			<	.05980	<	.13079	.01592+-	.00558	.27+-	.28	P
16	S		*	1.53960+-	.17560	3.33395+-	.50678	1.46502+-	.10588	.95+-	.13	S
17	CL			.03110+-	.01040	.06735+-	.02352	.05732+-	.00611	1.84+-	.65	CL
19	K		*	.63180+-	.07170	1.36814+-	.20738	.73306+-	.05432	1.16+-	.16	K
20	CA		*	4.54760+-	.51010	9.84768+-	1.48303	5.11252+-	.38763	1.12+-	.15	CA
22	TI		*	.21600+-	.04890	.46774+-	.11585	.21422+-	.01569	.99+-	.24	TI
23	V			<	.01400	<	.03068	.00768+-	.00150	.55+-	.56	V
24	CR			<	.00000	<	.00195	.00528+-	.00051	.00+-	.00	CR
25	MN		*	.04620+-	.00530	.10004+-	.01526	.03424+-	.00253	.74+-	.10	MN
26	FE		*	2.94890+-	.33130	6.38575+-	.96252	1.88374+-	.12104	.64+-	.08	FE
28	NI			<	.00080	<	.00196	.00520+-	.00194	6.50+-	7.70	NI
29	CU			2.12860+-	.23910	4.60941+-	.69471	.55978+-	.03384	.26+-	.03	CU
30	ZN		*	.06230+-	.01270	.13491+-	.03066	.06966+-	.00557	1.12+-	.24	ZN
31	GA			<	.00000	<	.00108	.00087+-	.00030	.00+-	.00	GA
33	AS		*	.01460+-	.00410	.03162+-	.00943	.01476+-	.00604	1.01+-	.50	AS
34	SE			.00190+-	.00040	.00411+-	.00096	.00052+-	.00064	.27+-	.34	SE
35	BR		*	<	.00000	<	.00108	.00101+-	.00251	.00+-	.00	BR
37	RB			.00410+-	.00070	.00888+-	.00176	.00467+-	.00035	1.14+-	.21	RB
38	SR			.02000+-	.00230	.04331+-	.00661	.01258+-	.00101	.63+-	.09	SR
39	Y			<	.00000	<	.00152	.00252+-	.00042	.00+-	.00	Y
40	ZR			<	.00000	<	.00693	.00225+-	.00130	.00+-	.00	ZR
42	MO			.02190+-	.00330	.04742+-	.00859	.00580+-	.00083	.26+-	.06	MO
46	PD			<	.00000	<	.00390	.00000+-	.00076	.00+-	.00	PD
47	AG			<	.00000	<	.00563	.00029+-	.00097	.00+-	.00	AG
48	CD			<	.00000	<	.00758	.00139+-	.00132	.00+-	.00	CD
49	IN			<	.00000	<	.00888	.00136+-	.00149	.00+-	.00	IN
50	SN			<	.00000	<	.01039	.00257+-	.00180	.00+-	.00	SN
51	SB			<	.00000	<	.02274	.00860+-	.00415	.00+-	.00	SB
56	BA			<	.00000	<	.04158	.00000+-	.00777	.00+-	.00	BA
57	LA			<	.00000	<	.07622	.02025+-	.01335	.00+-	.00	LA
80	HG			<	.00000	<	.00087	.00014+-	.00023	.00+-	.00	HG
82	PB		*	.04720+-	.00590	.10221+-	.01639	.04653+-	.00536	.99+-	.17	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.7+- 1.1 COARSE: 46.2+- 4.6 TOTAL: 56.9+- 4.8

RESULTS FOR CMB SITE: HD 783 784 YEAR: 87 DATE: 0127
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9573
CHI SQUARE: 2.8227
DF: 7

#	TYPE	UG/M3		%	
5	5095	1.249+-	.453	2.195+-	.817
7	GYPSU	6.906+-	1.144	12.139+-	2.254
13	KNECT	28.893+-	4.557	50.783+-	9.076
21	2NCD2	.474+-	.064	.832+-	.132
22	2NCD3	.144+-	.035	.254+-	.065
26	CHORM	1.919+-	.388	3.372+-	.738
28	DUSTO	17.880+-	2.660	31.427+-	5.369
	TOTAL:	57.464+-	2.934	101.003+-	9.931

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			56.89370+-	4.78075	100.00000+-	11.88357	57.46413+-	2.93419	1.01+-	.10	TOTAL
13	AL		*	2.19830+-	.24060	3.86387+-	.53315	2.80669+-	.17688	1.28+-	.16	AL
14	SI		*	10.20300+-	.99011	17.93344+-	2.30205	9.67783+-	.59410	.95+-	.11	SI
15	P			<	.05980	<	.10634	.01750+-	.00585	.29+-	.31	P
16	S		*	2.27870+-	.19518	4.00519+-	.48058	2.20412+-	.11149	.97+-	.10	S
17	CL			.07260+-	.01237	.12761+-	.02424	.05732+-	.00640	.79+-	.16	CL
19	K		*	.76000+-	.07321	1.33582+-	.17076	.86329+-	.05577	1.14+-	.13	K
20	CA		*	4.96030+-	.51222	8.71854+-	1.16072	5.52522+-	.38925	1.11+-	.14	CA
22	TI		*	.24980+-	.04906	.43906+-	.09380	.24013+-	.01589	.96+-	.20	TI
23	V			.01440+-	.01411	.02531+-	.02490	.00811+-	.00154	.56+-	.56	V
24	CR			<	.00000	<	.00173	.00571+-	.00053	.00+-	.00	CR
25	MN		*	.04920+-	.00535	.08648+-	.01188	.03803+-	.00256	.77+-	.10	MN
26	FE		*	3.30530+-	.33372	5.80961+-	.76314	2.20230+-	.12329	.67+-	.08	FE
28	NI			.00120+-	.00098	.00211+-	.00174	.00657+-	.00219	5.47+-	4.85	NI
29	CU			2.41990+-	.24133	4.25337+-	.55467	.77078+-	.03842	.32+-	.04	CU
30	ZN		*	.12900+-	.01485	.22674+-	.03232	.14233+-	.00756	1.10+-	.14	ZN
31	GA			<	.00040	<	.00124	.00110+-	.00049	2.74+-	5.00	GA
33	AS		*	.07830+-	.01072	.13763+-	.02210	.06200+-	.00912	.79+-	.16	AS
34	SE			.01250+-	.00136	.02197+-	.00302	.00063+-	.00078	.05+-	.06	SE
35	BR		*	.00320+-	.00130	.00562+-	.00233	.00134+-	.00417	.42+-	1.32	BR
37	RB			.00410+-	.00086	.00721+-	.00163	.00512+-	.00036	1.25+-	.28	RB
38	SR			.02080+-	.00238	.03656+-	.00519	.01334+-	.00102	.64+-	.09	SR
39	Y			<	.00000	<	.00187	.00303+-	.00057	.00+-	.00	Y
40	ZR			<	.00000	<	.00759	.00234+-	.00142	.00+-	.00	ZR
42	MO			.02190+-	.00386	.03849+-	.00751	.00746+-	.00090	.34+-	.07	MO
46	PD			<	.00000	<	.00460	.00000+-	.00083	.00+-	.00	PD
47	AG			<	.00000	<	.00622	.00058+-	.00105	.00+-	.00	AG
48	CD			<	.00390	<	.00847	.00608+-	.00151	1.56+-	1.96	CD
49	IN			<	.00000	<	.01007	.00152+-	.00166	.00+-	.00	IN
50	SN			<	.00000	<	.01206	.00426+-	.00200	.00+-	.00	SN
51	SB			<	.00000	<	.02610	.01560+-	.00460	.00+-	.00	SB
56	BA			<	.00000	<	.04860	.00000+-	.00849	.00+-	.00	BA
57	LA			<	.00000	<	.08775	.02025+-	.01494	.00+-	.00	LA
80	HG			<	.00020	<	.00099	.00014+-	.00032	.72+-	2.61	HG
82	PB		*	.16600+-	.01473	.29177+-	.03566	.17070+-	.01296	1.03+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.7+- 1.1 COARSE: 46.2+- 4.6 TOTAL: 56.9+- 4.8

RESULTS FOR CMB SITE: GP 780 779 YEAR: 87 DATE: 0127
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9584
CHI SQUARE: 2.8400
DF: 7

#	TYPE	UG/M3		%	
5	5095	2.818+-	.387	8.823+-	1.398
7	GYPSU	1.680+-	.521	5.261+-	1.683
13	KNECT	4.843+-	1.430	15.162+-	4.634
22	2NCD3	.173+-	.039	.543+-	.130
24	SLPR2	.704+-	.068	2.205+-	.275
26	CHORM	1.012+-	.206	3.169+-	.691
28	DUSTO	18.840+-	1.335	58.982+-	6.271
	TOTAL:	30.071+-	1.267	94.145+-	8.451

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			31.94090+-	2.53159	100.00000+-	11.20886	30.07069+-	1.26695	.94+-	.08	TOTAL
13	AL	*		1.65220+-	.17471	5.17268+-	.68356	1.64749+-	.11243	1.00+-	.13	AL
14	SI	*		6.50550+-	.62530	20.36730+-	2.53740	6.06006+-	.42616	.93+-	.11	SI
15	P			<	.00000	<	.02824	.00428+-	.00521	.00+-	.00	P
16	S	*		1.41210+-	.11799	4.42098+-	.50916	1.33870+-	.05635	.95+-	.09	S
17	CL			.02480+-	.00793	.07764+-	.02558	.00948+-	.00422	.38+-	.21	CL
19	K	*		.51580+-	.04764	1.61486+-	.19653	.69728+-	.05640	1.35+-	.17	K
20	CA	*		1.15200+-	.11122	3.60666+-	.45052	1.26812+-	.06685	1.10+-	.12	CA
22	TI	*		.17540+-	.01793	.54914+-	.07103	.18935+-	.01583	1.08+-	.14	TI
23	V			.01000+-	.00832	.03131+-	.02618	.00354+-	.00135	.35+-	.32	V
24	CR			<	.00000	<	.00210	.00194+-	.00033	.00+-	.00	CR
25	MN	*		.03070+-	.00301	.09612+-	.01211	.01989+-	.00138	.65+-	.08	MN
26	FE	*		1.71110+-	.16711	5.35708+-	.67380	1.38258+-	.09364	.81+-	.10	FE
28	NI			.00170+-	.00058	.00532+-	.00187	.00354+-	.00208	2.08+-	1.42	NI
29	CU			.88420+-	.07984	2.76824+-	.33261	.41647+-	.02666	.47+-	.05	CU
30	ZN	*		.17350+-	.01523	.54319+-	.06425	.18751+-	.01344	1.08+-	.12	ZN
31	GA			<	.00000	<	.00308	.00016+-	.00071	.00+-	.00	GA
33	AS	*		.11120+-	.01757	.34814+-	.06154	.10944+-	.01466	.98+-	.20	AS
34	SE			.01930+-	.00233	.06042+-	.00874	.00023+-	.00112	.01+-	.06	SE
35	BR	*		<	.00030	<	.00269	.00051+-	.00776	1.71+-	26.33	BR
37	RB			.00250+-	.00064	.00783+-	.00210	.00376+-	.00034	1.50+-	.41	RB
38	SR			.00780+-	.00108	.02442+-	.00389	.00549+-	.00040	.70+-	.11	SR
39	Y			<	.00000	<	.00339	.00187+-	.00080	.00+-	.00	Y
40	ZR			<	.00000	<	.01041	.00045+-	.00091	.00+-	.00	ZR
42	MO			.01700+-	.00425	.05322+-	.01397	.00837+-	.00066	.49+-	.13	MO
46	PD			<	.00000	<	.00620	.00014+-	.00050	.00+-	.00	PD
47	AG			<	.00000	<	.00842	.00030+-	.00066	.00+-	.00	AG
48	CD			<	.00000	<	.01108	.01243+-	.00149	.00+-	.00	CD
49	IN			<	.00000	<	.01351	.00018+-	.00109	.00+-	.00	IN
50	SN			<	.00000	<	.01594	.00640+-	.00138	.00+-	.00	SN
51	SB			<	.00000	<	.03587	.01416+-	.00312	.00+-	.00	SB
56	BA			<	.00000	<	.06553	.00057+-	.00523	.00+-	.00	BA
57	LA			<	.00000	<	.12264	.00540+-	.00933	.00+-	.00	LA
80	HG			<	.00000	<	.00157	.00004+-	.00081	.00+-	.00	HG
82	PB	*		.27840+-	.02668	.87161+-	.10839	.26296+-	.02250	.94+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 9.1+- 1.0 COARSE: 22.9+- 2.3 TOTAL: 31.9+- 2.5

RESULTS FOR CMB SITE: HD 785 786 YEAR: 87 DATE: 0128
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9742
CHI SQUARE: 2.1619
DF: 6

#	TYPE	UG/M3		%	
5	5095	5.610+-	.973	29.995+-	6.045
7	GYPSU	2.270+-	.367	12.139+-	2.324
16	SSFF1	.696+-	.234	3.723+-	1.310
17	MTFF1	.318+-	.194	1.699+-	1.050
22	2NCO3	1.161+-	.364	6.208+-	2.047
28	DUSTO	4.483+-	.308	23.970+-	2.962
	TOTAL:	14.538+-	1.006	77.734+-	9.621

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			18.70230+-	1.91930	100.00000+-	14.51319	14.53805+-	1.00594	.78+-	.10	TOTAL
13	AL		*	.32460+-	.04570	1.73562+-	.30238	.45088+-	.04514	1.39+-	.24	AL
14	SI		*	1.56290+-	.17970	8.35673+-	1.28790	1.67047+-	.16729	1.07+-	.16	SI
15	P			<	.00000	<	.05240	.00171+-	.00372	.00+-	.00	P
16	S		*	1.81550+-	.20960	9.70736+-	1.49948	1.81550+-	.07719	1.00+-	.12	S
17	CL			.04130+-	.01050	.22083+-	.06054	.00000+-	.00496	.00+-	.12	CL
19	K		*	.17210+-	.01980	.92021+-	.14187	.14327+-	.01373	.83+-	.12	K
20	CA		*	.59190+-	.06650	3.16485+-	.48158	.59190+-	.05352	1.00+-	.14	CA
22	TI		*	.03060+-	.00360	.16362+-	.02554	.02735+-	.00274	.89+-	.14	TI
23	V			<	.00040	<	.00322	.00039+-	.00038	.98+-	1.74	V
24	CR			.00050+-	.00050	.00267+-	.00269	.00022+-	.00023	.44+-	.64	CR
25	MN		*	.00290+-	.00070	.01551+-	.00407	.00389+-	.00038	1.34+-	.35	MN
26	FE		*	.34020+-	.03830	1.81903+-	.27710	.23843+-	.02230	.70+-	.10	FE
28	NI			<	.00040	<	.00268	.00103+-	.00072	2.57+-	3.68	NI
29	CU			.31900+-	.03580	1.70567+-	.25939	.04994+-	.00337	.16+-	.02	CU
30	ZN		*	.28870+-	.03250	1.54366+-	.23515	.28998+-	.01969	1.00+-	.13	ZN
31	GA			<	.00130	<	.00965	.00041+-	.00123	.31+-	1.04	GA
33	AS		*	.30370+-	.04340	1.62386+-	.28570	.30821+-	.02291	1.01+-	.16	AS
34	SE			.02170+-	.00260	.11603+-	.01830	.00000+-	.00198	.00+-	.09	SE
35	BR		*	<	.00280	<	.03639	.00805+-	.01154	2.87+-	8.11	BR
37	RB			<	.00000	<	.00321	.00046+-	.00023	.00+-	.00	RB
38	SR			.00180+-	.00070	.00962+-	.00387	.00079+-	.00015	.44+-	.19	SR
39	Y			<	.00000	<	.00909	.00129+-	.00116	.00+-	.00	Y
40	ZR			<	.00000	<	.01711	.00017+-	.00073	.00+-	.00	ZR
42	MO			<	.00000	<	.01230	.00344+-	.00044	.00+-	.00	MO
46	PD			<	.00000	<	.01123	.00000+-	.00037	.00+-	.00	PD
47	AG			<	.00000	<	.01444	.00073+-	.00043	.00+-	.00	AG
48	CD			.01280+-	.00400	.06844+-	.02251	.03072+-	.00202	2.40+-	.77	CD
49	IN			<	.00000	<	.02353	.00107+-	.00079	.00+-	.00	IN
50	SN			<	.00000	<	.02887	.00960+-	.00111	.00+-	.00	SN
51	SB			.04670+-	.01360	.24970+-	.07710	.02937+-	.00281	.63+-	.19	SB
56	BA			<	.00000	<	.11549	.00000+-	.00363	.00+-	.00	BA
57	LA			<	.00000	<	.21120	.00000+-	.00716	.00+-	.00	LA
80	HG			.00130+-	.00060	.00695+-	.00329	.00000+-	.00109	.00+-	.84	HG
82	PB		*	.48470+-	.05450	2.59166+-	.39453	.48334+-	.03330	1.00+-	.13	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 18.7+- 1.9 COARSE: 59.3+- 5.9 TOTAL: 78.0+- 6.3

RESULTS FOR THE SITE: HC 785 TEX YEAR 87 DATE: [illegible]
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9678
CHI SQUARE: 1.7616
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	5.319+-	1.044	8.971+-	1.977
13	KNECT	46.817+-	6.141	78.966+-	13.041
16	SSFF1	.000+-	.000	.000+-	.000
17	MTFF1	.000+-	.000	.000+-	.000
19	SSFF2	.648+-	.097	1.094+-	.197
22	2NCD3	.000+-	.000	.000+-	.000
28	DUSTO	9.706+-	3.180	16.371+-	5.609
	TOTAL:	62.490+-	3.940	105.402+-	12.491

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			59.28750+-	5.94890	100.00000+-	14.19020	62.48998+-	3.93992	1.05+-	.12	TOTAL
13	AL		*	2.11810+-	.27270	3.57259+-	.58315	3.00034+-	.24360	1.42+-	.22	AL
14	SI		*	9.99080+-	1.12160	16.85144+-	2.53731	9.83713+-	.77253	.98+-	.13	SI
15	P			<	.00000	<	.02277	.02580+-	.00789	.00+-	.00	P
16	S		*	1.34610+-	.15760	2.27046+-	.35009	1.35655+-	.11151	1.01+-	.14	S
17	CL			.02900+-	.01310	.04891+-	.02263	.09288+-	.00984	3.20+-	1.49	CL
19	K		*	.70780+-	.08070	1.19384+-	.18132	.74055+-	.05220	1.05+-	.14	K
20	CA		*	7.53470+-	.84480	12.70875+-	1.91220	7.29882+-	.60638	.97+-	.14	CA
22	TI		*	.23810+-	.05380	.40160+-	.09929	.22004+-	.01574	.92+-	.22	TI
23	V			<	.01720	<	.02932	.01063+-	.00177	.62+-	.63	V
24	CR			<	.00000	<	.00169	.00733+-	.00083	.00+-	.00	CR
25	MN		*	.05060+-	.00580	.08535+-	.01300	.04486+-	.00374	.89+-	.13	MN
26	FE		*	3.03880+-	.34130	5.12553+-	.77194	2.07596+-	.15593	.68+-	.09	FE
28	NI			.00380+-	.00100	.00641+-	.00181	.00506+-	.00151	1.33+-	.53	NI
29	CU			1.66770+-	.18760	2.81290+-	.42401	.46722+-	.03232	.28+-	.04	CU
30	ZN		*	.09550+-	.01430	.16108+-	.02903	.08733+-	.01283	.91+-	.19	ZN
31	GA			<	.00000	<	.00118	.00140+-	.00113	.00+-	.00	GA
33	AS		*	.04850+-	.01000	.08180+-	.01876	.06061+-	.01376	1.25+-	.38	AS
34	SE			.00300+-	.00060	.00506+-	.00113	.00056+-	.00166	.19+-	.55	SE
35	BR		*	<	.00000	<	.00169	.00132+-	.01164	.00+-	.00	BR
37	RB			.00460+-	.00070	.00776+-	.00141	.00500+-	.00041	1.09+-	.19	RB
38	SR			.02460+-	.00290	.04149+-	.00642	.01751+-	.00156	.71+-	.11	SR
39	Y			<	.00000	<	.00135	.00350+-	.00078	.00+-	.00	Y
40	ZR			<	.00000	<	.00607	.00365+-	.00203	.00+-	.00	ZR
42	MO			.02740+-	.00370	.04622+-	.00778	.00497+-	.00116	.18+-	.05	MO
46	PD			<	.00000	<	.00337	.00000+-	.00111	.00+-	.00	PD
47	AG			<	.00000	<	.00439	.00000+-	.00143	.00+-	.00	AG
48	CD			<	.00000	<	.00590	.00294+-	.00217	.00+-	.00	CD
49	IN			<	.00000	<	.00692	.00394+-	.00218	.00+-	.00	IN
50	SN			<	.00000	<	.00843	.00641+-	.00283	.00+-	.00	SN
51	SB			<	.00000	<	.01838	.01615+-	.00649	.00+-	.00	SB
56	BA			<	.00000	<	.03323	.00000+-	.01131	.00+-	.00	BA
57	LA			<	.00000	<	.05819	.03282+-	.01943	.00+-	.00	LA
80	HG			<	.00000	<	.00084	.00023+-	.00103	.00+-	.00	HG
82	PB		*	.07350+-	.01020	.12397+-	.02123	.07212+-	.01048	.98+-	.20	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 18.7+- 1.9 COARSE: 59.3+- 5.9 TOTAL: 78.0+- 6.3

RESULTS FOR CMB SITE: HD 785 786 YEAR: 87 DATE: 0128
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9678
CHI SQUARE: 1.7616
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.610+-	.973	7.193+-	1.374
7	GYPSU	7.589+-	1.106	9.731+-	1.619
13	KNECT	46.817+-	6.141	60.029+-	9.228
16	SSFF1	.696+-	.234	.893+-	.309
17	MTFF1	.318+-	.194	.407+-	.250
19	SSFF2	.648+-	.097	.831+-	.141
22	2NCD3	1.161+-	.364	1.489+-	.482
28	DUSTO	14.189+-	3.194	18.194+-	4.348
	TOTAL:	77.028+-	4.066	98.767+-	9.479

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			77.98980+-	6.25085	100.00000+-	11.33486	77.02804+-	4.06632	.99+-	.09	TOTAL
13	AL	*		2.44270+-	.27650	3.13208+-	.43441	3.45123+-	.24775	1.41+-	.19	AL
14	SI	*		11.55370+-	1.13590	14.81437+-	1.87914	11.50760+-	.79044	1.00+-	.12	SI
15	P			<	.00000	<	.02139	.02751+-	.00872	.00+-	.00	P
16	S	*		3.16160+-	.26224	4.05386+-	.46758	3.17205+-	.13561	1.00+-	.09	S
17	CL			.07030+-	.01679	.09014+-	.02271	.09288+-	.01102	1.32+-	.35	CL
19	K	*		.87990+-	.08309	1.12822+-	.13974	.88381+-	.05397	1.00+-	.11	K
20	CA	*		8.12660+-	.84741	10.42008+-	1.37045	7.89072+-	.60874	.97+-	.13	CA
22	TI	*		.26870+-	.05392	.34453+-	.07445	.24739+-	.01598	.92+-	.19	TI
23	V			.01760+-	.01731	.02257+-	.02227	.01102+-	.00181	.63+-	.62	V
24	CR			<	.00050	<	.00143	.00755+-	.00086	15.10+-	33.80	CR
25	MN	*		.05350+-	.00584	.06860+-	.00929	.04875+-	.00376	.91+-	.12	MN
26	FE	*		3.37900+-	.34344	4.33262+-	.56081	2.31438+-	.15752	.68+-	.08	FE
28	NI			.00420+-	.00112	.00539+-	.00150	.00609+-	.00167	1.45+-	.55	NI
29	CU			1.98670+-	.19099	2.54738+-	.31883	.51716+-	.03249	.26+-	.03	CU
30	ZN	*		.38420+-	.03551	.49263+-	.06026	.37731+-	.02351	.98+-	.11	ZN
31	GA			<	.00130	<	.00248	.00181+-	.00167	1.39+-	2.44	GA
33	AS	*		.35220+-	.04454	.45160+-	.06761	.36882+-	.02673	1.05+-	.15	AS
34	SE			.02470+-	.00267	.03167+-	.00426	.00056+-	.00259	.02+-	.10	SE
35	BR	*		<	.00280	<	.00882	.00937+-	.01640	3.35+-	10.09	BR
37	RB			.00460+-	.00092	.00590+-	.00127	.00546+-	.00047	1.19+-	.26	RB
38	SR			.02640+-	.00298	.03385+-	.00469	.01830+-	.00157	.69+-	.10	SR
39	Y			<	.00000	<	.00241	.00479+-	.00139	.00+-	.00	Y
40	ZR			<	.00000	<	.00618	.00382+-	.00216	.00+-	.00	ZR
42	MO			.02740+-	.00436	.03513+-	.00626	.00841+-	.00124	.31+-	.07	MO
46	PD			<	.00000	<	.00372	.00000+-	.00117	.00+-	.00	PD
47	AG			<	.00000	<	.00481	.00073+-	.00150	.00+-	.00	AG
48	CD			.01280+-	.00532	.01641+-	.00694	.03366+-	.00296	2.63+-	1.12	CD
49	IN			<	.00000	<	.00771	.00501+-	.00231	.00+-	.00	IN
50	SN			<	.00000	<	.00944	.01601+-	.00304	.00+-	.00	SN
51	SB			.04670+-	.01743	.05988+-	.02286	.04553+-	.00707	.97+-	.39	SB
56	BA			<	.00000	<	.03748	.00000+-	.01188	.00+-	.00	BA
57	LA			<	.00000	<	.06725	.03282+-	.02071	.00+-	.00	LA
80	HG			.00130+-	.00078	.00167+-	.00101	.00023+-	.00150	.18+-	1.16	HG
82	PB		*	.55820+-	.05545	.71573+-	.09135	.55546+-	.03491	1.00+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 18.7+- 1.9 COARSE: 59.3+- 5.9 TOTAL: 78.0+- 6.3

RESULTS FOR CMB SITE GR 751 752 YEAR 87 DATE 0125
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9716
CHI SQUARE: 2.0884
DF: 7

#	TYPE	UG/M3		%	
5	5095	5.973+-	1.007	28.990+-	5.713
7	GYPSU	.987+-	.203	4.793+-	1.101
21	2NCD2	1.492+-	.176	7.244+-	1.132
26	CHORM	1.282+-	.483	6.221+-	2.427
28	DUSTO	7.678+-	.577	37.263+-	4.726
	TOTAL:	17.413+-	1.092	84.512+-	10.127

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			20.60410+-	2.10400	100.00000+-	14.44133	17.41284+-	1.09174	.85+-	.10	TOTAL
13	AL	*		.60180+-	.07740	2.92078+-	.47966	.78591+-	.07724	1.31+-	.21	AL
14	SI	*		2.67700+-	.30480	12.99256+-	1.98712	2.92693+-	.28622	1.09+-	.16	SI
15	P			<	.00000	<	.04805	.00293+-	.00358	.00+-	.00	P
16	S	*		1.88930+-	.21560	9.16953+-	1.40417	1.88930+-	.07489	1.00+-	.12	S
17	CL			.01610+-	.00790	.07814+-	.03916	.00000+-	.00569	.00+-	.35	CL
19	K	*		.23850+-	.02720	1.15754+-	.17720	.24195+-	.02349	1.01+-	.15	K
20	CA	*		.34580+-	.03900	1.67831+-	.25534	.34580+-	.02581	1.00+-	.14	CA
22	TI	*		.05910+-	.00680	.28684+-	.04413	.04795+-	.00469	.81+-	.12	TI
23	V			.00240+-	.00240	.01165+-	.01171	.00077+-	.00064	.32+-	.42	V
24	CR			<	.00000	<	.00243	.00074+-	.00024	.00+-	.00	CR
25	MN	*		.01110+-	.00150	.05387+-	.00912	.00696+-	.00065	.63+-	.10	MN
26	FE	*		.55720+-	.06260	2.70432+-	.41057	.56722+-	.04240	1.02+-	.14	FE
28	NI			.00240+-	.00050	.01165+-	.00270	.00235+-	.00172	.98+-	.75	NI
29	CU			.23010+-	.02590	1.11677+-	.16972	.35658+-	.02994	1.55+-	.22	CU
30	ZN	*		.17510+-	.01970	.84983+-	.12912	.18241+-	.01400	1.04+-	.14	ZN
31	GA			<	.00000	<	.00631	.00073+-	.00122	.00+-	.00	GA
33	AS	*		.20020+-	.02970	.97165+-	.17499	.14199+-	.02151	.71+-	.15	AS
34	SE			.01390+-	.00170	.06746+-	.01075	.00018+-	.00136	.01+-	.10	SE
35	BR	*		.00540+-	.00430	.02621+-	.02104	.00054+-	.01050	.10+-	1.95	BR
37	RB			<	.00000	<	.00291	.00083+-	.00024	.00+-	.00	RB
38	SR			.00150+-	.00060	.00728+-	.00301	.00139+-	.00023	.93+-	.40	SR
39	Y			<	.00000	<	.00679	.00114+-	.00119	.00+-	.00	Y
40	ZR			<	.00000	<	.01553	.00028+-	.00112	.00+-	.00	ZR
42	MO			<	.00000	<	.01116	.00321+-	.00064	.00+-	.00	MO
46	PD			<	.00000	<	.01019	.00000+-	.00064	.00+-	.00	PD
47	AG			<	.00000	<	.01359	.00090+-	.00074	.00+-	.00	AG
48	CD			.01350+-	.00410	.06552+-	.02099	.01479+-	.00183	1.10+-	.36	CD
49	IN			<	.00000	<	.02233	.00052+-	.00136	.00+-	.00	IN
50	SN			<	.00000	<	.02572	.00533+-	.00169	.00+-	.00	SN
51	SB			<	.00000	<	.05873	.02205+-	.00415	.00+-	.00	SB
56	BA			<	.00000	<	.10580	.00000+-	.00630	.00+-	.00	BA
57	LA			<	.00000	<	.19219	.00000+-	.01242	.00+-	.00	LA
80	HG			.00060+-	.00050	.00291+-	.00244	.00000+-	.00070	.00+-	1.17	HG
82	PB	*		.34900+-	.03930	1.69384+-	.25749	.38177+-	.03714	1.09+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 20.6+- 2.1 COARSE: 62.3+- 6.3 TOTAL: 82.9+- 6.6

RESULTS FOR CMB SITE: GR 781 782 YEAR: 87 DATE: 0128
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9402
CHI SQUARE: 3.2460
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	4.257+-	1.007	6.832+-	1.756
13	KNECT	8.467+-	3.280	13.588+-	5.438
19	SSFF2	.615+-	.089	.987+-	.174
21	2NCD2	.000+-	.000	.000+-	.000
26	CHORM	.000+-	.000	.000+-	.000
28	DUSTO	47.841+-	3.852	76.781+-	9.878
	TOTAL:	61.180+-	3.491	98.188+-	11.334

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			62.30860+-	6.25230	100.00000+-	14.19080	61.17978+-	3.49110	.98+-	.11	TOTAL
13	AL	*		2.95120+-	.38420	4.73642+-	.77852	3.65314+-	.32574	1.24+-	.20	AL
14	SI	*		14.62660+-	1.64310	23.47445+-	3.53588	13.68814+-	1.24132	.94+-	.14	SI
15	P			<	.00000	<	.14011	.00467+-	.01216	.00+-	.00	P
16	S	*		1.32350+-	.15510	2.12410+-	.32771	1.25235+-	.09778	.95+-	.13	S
17	CL			.01240+-	.01130	.01990+-	.01825	.01680+-	.00607	1.35+-	1.33	CL
19	K	*		1.28740+-	.14510	2.06617+-	.31179	1.76673+-	.16932	1.37+-	.20	K
20	CA	*		2.51060+-	.28210	4.02930+-	.60700	2.68855+-	.15935	1.07+-	.14	CA
22	TI	*		.45390+-	.10260	.72847+-	.18016	.50015+-	.04787	1.10+-	.27	TI
23	V			<	.02670	<	.04371	.00860+-	.00404	.32+-	.36	V
24	CR			<	.00000	<	.00193	.00368+-	.00099	.00+-	.00	CR
25	MN	*		.08160+-	.00920	.13096+-	.01977	.04716+-	.00407	.58+-	.08	MN
26	FE	*		4.16600+-	.46820	6.68608+-	1.00735	3.06312+-	.27518	.74+-	.11	FE
28	NI			.00130+-	.00080	.00209+-	.00130	.00585+-	.00521	4.50+-	4.87	NI
29	CU			1.15630+-	.13010	1.85576+-	.27977	.53053+-	.04063	.46+-	.06	CU
30	ZN	*		.09890+-	.01300	.15873+-	.02625	.08751+-	.01226	.88+-	.17	ZN
31	GA			<	.00000	<	.00112	.00025+-	.00108	.00+-	.00	GA
33	AS	*		.03620+-	.00790	.05810+-	.01395	.05771+-	.01304	1.59+-	.50	AS
34	SE			.00310+-	.00060	.00498+-	.00108	.00010+-	.00158	.03+-	.51	SE
35	BR	*		<	.00000	<	.00128	.00139+-	.01110	.00+-	.00	BR
37	RB			.00870+-	.00110	.01396+-	.00225	.00975+-	.00092	1.12+-	.18	RB
38	SR			.02110+-	.00250	.03386+-	.00526	.01271+-	.00105	.60+-	.09	SR
39	Y			<	.00080	<	.00145	.00280+-	.00084	3.50+-	4.07	Y
40	ZR			<	.00000	<	.00578	.00066+-	.00230	.00+-	.00	ZR
42	MO			.01640+-	.00280	.02632+-	.00521	.01549+-	.00166	.94+-	.19	MO
46	PD			<	.00000	<	.00305	.00000+-	.00126	.00+-	.00	PD
47	AG			<	.00000	<	.00401	.00000+-	.00172	.00+-	.00	AG
48	CD			<	.00000	<	.00562	.00279+-	.00244	.00+-	.00	CD
49	IN			<	.00000	<	.00626	.00205+-	.00274	.00+-	.00	IN
50	SN			<	.00000	<	.00802	.00363+-	.00323	.00+-	.00	SN
51	SB			<	.00000	<	.01733	.00720+-	.00742	.00+-	.00	SB
56	BA			<	.00000	<	.03258	.00000+-	.01347	.00+-	.00	BA
57	LA			<	.00000	<	.05730	.00594+-	.02307	.00+-	.00	LA
80	HG			<	.00000	<	.00064	.00004+-	.00100	.00+-	.00	HG
82	PB		*	.07020+-	.00920	.11267+-	.01860	.06246+-	.00993	.89+-	.18	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 20.6+- 2.1 COARSE: 62.3+- 6.3 TOTAL: 82.9+- 6.6

RESULTS FOR ONE SITE, SPECIFIED YEAR: 87 DATE: 0128
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9402
CHI SQUARE: 3.2460
DF: 8

#	TYPE	UG/M3		%	
5	5095	5.973+-	1.007	7.204+-	1.343
7	GYPSU	5.244+-	1.027	6.325+-	1.337
13	KNECT	8.467+-	3.280	10.212+-	4.039
19	SSFF2	.615+-	.089	.742+-	.123
21	2NCD2	1.492+-	.176	1.800+-	.257
26	CHORM	1.282+-	.483	1.546+-	.595
28	DUSTO	55.519+-	3.895	66.961+-	7.103
	TOTAL:	78.593+-	3.658	94.790+-	8.737

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			82.91270+-	6.59682	100.00000+-	11.25197	78.59262+-	3.65783	.95+-	.09	TOTAL
13	AL	*		3.55300+-	.39192	4.28523+-	.58282	4.43905+-	.33477	1.25+-	.17	AL
14	SI	*		17.30360+-	1.67113	20.86966+-	2.61142	16.61507+-	1.27389	.96+-	.12	SI
15	P			<	.00000	<	.10597	.00760+-	.01267	.00+-	.00	P
16	S	*		3.21280+-	.26559	3.87492+-	.44459	3.14165+-	.12316	.98+-	.09	S
17	CL			.02850+-	.01379	.03437+-	.01685	.01680+-	.00832	.59+-	.41	CL
19	K	*		1.52590+-	.14763	1.84037+-	.23053	2.00868+-	.17094	1.32+-	.17	K
20	CA	*		2.85640+-	.28478	3.44507+-	.43944	3.03435+-	.16143	1.06+-	.12	CA
22	TI	*		.51300+-	.10283	.61872+-	.13343	.54810+-	.04810	1.07+-	.23	TI
23	V			.02910+-	.02721	.03510+-	.03293	.00938+-	.00409	.32+-	.33	V
24	CR			<	.00000	<	.00157	.00442+-	.00102	.00+-	.00	CR
25	MN	*		.09270+-	.00932	.11180+-	.01434	.05412+-	.00412	.58+-	.07	MN
26	FE	*		4.72320+-	.47237	5.69659+-	.72801	3.63034+-	.27842	.77+-	.10	FE
28	NI			.00370+-	.00094	.00446+-	.00119	.00819+-	.00549	2.21+-	1.59	NI
29	CU			1.38640+-	.13265	1.67212+-	.20808	.88710+-	.05047	.64+-	.07	CU
30	ZN	*		.27400+-	.02360	.33047+-	.03875	.26992+-	.01861	.99+-	.11	ZN
31	GA			<	.00000	<	.00178	.00098+-	.00163	.00+-	.00	GA
33	AS	*		.23640+-	.03073	.28512+-	.04346	.19969+-	.02515	.84+-	.15	AS
34	SE			.01700+-	.00180	.02050+-	.00272	.00028+-	.00208	.02+-	.12	SE
35	BR	*		.00540+-	.00437	.00651+-	.00530	.00194+-	.01528	.36+-	2.84	BR
37	RB			.00870+-	.00125	.01049+-	.00173	.01059+-	.00095	1.22+-	.21	RB
38	SR			.02260+-	.00257	.02726+-	.00378	.01410+-	.00107	.62+-	.09	SR
39	Y			<	.00080	<	.00201	.00394+-	.00146	4.93+-	10.42	Y
40	ZR			<	.00000	<	.00581	.00094+-	.00256	.00+-	.00	ZR
42	MO			.01640+-	.00362	.01978+-	.00465	.01870+-	.00178	1.14+-	.27	MO
46	PD			<	.00000	<	.00342	.00000+-	.00141	.00+-	.00	PD
47	AG			<	.00000	<	.00453	.00090+-	.00187	.00+-	.00	AG
48	CD			.01350+-	.00539	.01628+-	.00663	.01758+-	.00305	1.30+-	.57	CD
49	IN			<	.00000	<	.00727	.00257+-	.00306	.00+-	.00	IN
50	SN			<	.00000	<	.00879	.00897+-	.00364	.00+-	.00	SN
51	SB			<	.00000	<	.01956	.02924+-	.00850	.00+-	.00	SB
56	BA			<	.00000	<	.03593	.00000+-	.01487	.00+-	.00	BA
57	LA			<	.00000	<	.06430	.00594+-	.02619	.00+-	.00	LA
80	HG			<	.00060	<	.00077	.00004+-	.00122	.07+-	2.04	HG
82	PB	*		.41920+-	.04036	.50559+-	.06315	.44423+-	.03844	1.06+-	.14	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 20.6+- 2.1 COARSE: 62.3+- 6.3 TOTAL: 82.9+- 6.6

RESULTS FOR CMB SITE: HD 791 792 YEAR: 87 DATE: 0130
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9582
CHI SQUARE: 2.3800
DF: 8

#	TYPE	UG/M3		%	
5	5095	1.592+-	.352	14.604+-	3.590
7	GYPSU	.896+-	.173	8.217+-	1.817
21	2NCD2	.772+-	.075	7.083+-	1.025
28	DUSTO	5.951+-	.408	54.600+-	6.926
	TOTAL:	9.210+-	.511	84.504+-	10.166

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			10.89870+-	1.16370	100.00000+-	15.10015	9.20980+-	.51053	.85+-	.10	TOTAL
13	AL		*	.51780+-	.06590	4.75103+-	.78927	.59850+-	.05985	1.16+-	.19	AL
14	SI		*	2.13310+-	.24270	19.57206+-	3.05388	2.21737+-	.22175	1.04+-	.16	SI
15	P			<	.01920	<	.17808	.00227+-	.00248	.12+-	.18	P
16	S		*	.61080+-	.07230	5.60434+-	.89340	.61080+-	.03016	1.00+-	.13	S
17	CL			.02180+-	.00630	.20002+-	.06162	.00000+-	.00303	.00+-	.14	CL
19	K		*	.16830+-	.01930	1.54422+-	.24196	.18316+-	.01820	1.09+-	.17	K
20	CA		*	.29220+-	.03300	2.68105+-	.41669	.29220+-	.02260	1.00+-	.14	CA
22	TI		*	.05170+-	.00600	.47437+-	.07481	.03630+-	.00363	.70+-	.11	TI
23	V			.00090+-	.00090	.00826+-	.00830	.00052+-	.00049	.58+-	.80	V
24	CR			<	.00000	<	.00642	.00021+-	.00017	.00+-	.00	CR
25	MN		*	.00220+-	.00100	.02019+-	.00943	.00496+-	.00050	2.26+-	1.05	MN
26	FE		*	.41250+-	.04640	3.78486+-	.58700	.29604+-	.02957	.72+-	.11	FE
28	NI			.00100+-	.00050	.00918+-	.00469	.00065+-	.00065	.65+-	.73	NI
29	CU			.14960+-	.01690	1.37264+-	.21337	.04589+-	.00417	.31+-	.04	CU
30	ZN		*	.06540+-	.00750	.60007+-	.09403	.06976+-	.00679	1.07+-	.16	ZN
31	GA			<	.00000	<	.00734	.00038+-	.00063	.00+-	.00	GA
33	AS		*	.09560+-	.01490	.87717+-	.16572	.06999+-	.01112	.73+-	.16	AS
34	SE			.01450+-	.00180	.13304+-	.02178	.00000+-	.00070	.00+-	.05	SE
35	BR		*	.00270+-	.00170	.02477+-	.01582	.00000+-	.00543	.00+-	2.01	BR
37	RB			<	.00010	<	.00734	.00061+-	.00015	6.13+-	49.06	RB
38	SR			.00160+-	.00100	.01468+-	.00931	.00101+-	.00017	.63+-	.41	SR
39	Y			<	.00000	<	.01193	.00075+-	.00063	.00+-	.00	Y
40	ZR			<	.00000	<	.04588	.00015+-	.00083	.00+-	.00	ZR
42	MO			<	.00000	<	.03395	.00052+-	.00046	.00+-	.00	MO
46	PD			<	.00000	<	.02936	.00000+-	.00049	.00+-	.00	PD
47	AG			<	.00000	<	.03762	.00046+-	.00056	.00+-	.00	AG
48	CD			<	.00000	<	.05046	.00765+-	.00112	.00+-	.00	CD
49	IN			<	.00000	<	.06239	.00027+-	.00104	.00+-	.00	IN
50	SN			<	.00000	<	.07616	.00276+-	.00125	.00+-	.00	SN
51	SB			<	.00000	<	.16975	.01140+-	.00285	.00+-	.00	SB
56	BA			<	.00000	<	.31105	.00000+-	.00481	.00+-	.00	BA
57	LA			<	.00000	<	.57163	.00000+-	.00950	.00+-	.00	LA
80	HG			<	.00030	<	.00551	.00000+-	.00037	.00+-	1.24	HG
82	PB		*	.18330+-	.02080	1.68185+-	.26205	.19264+-	.01920	1.05+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.9+- 1.2 COARSE: 60.6+- 6.1 TOTAL: 71.5+- 6.2

RESULTS FOR CME SITE: NC 791 792 YEAR: 87 DATE: 0130
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9625
CHI SQUARE: 2.0856
DF: 8

#	TYPE	UG/M3		%	
5	5095	.000+-	.000	.000+-	.000
7	GYPSU	3.442+-	.846	5.677+-	1.507
13	KNECT	12.140+-	3.297	20.022+-	5.796
19	SSFF2	.444+-	.066	.732+-	.132
21	2NCD2	.000+-	.000	.000+-	.000
28	DUSTO	43.805+-	3.630	72.244+-	9.397
	TOTAL:	59.831+-	3.317	98.675+-	11.305

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			60.63440+-	6.07950	100.00000+-	14.17959	59.83110+-	3.31696	.99+-	.11	TOTAL
13	AL	*		3.30310+-	.41110	5.44757+-	.87064	3.56470+-	.30187	1.08+-	.16	AL
14	SI	*		13.82040+-	1.55050	22.79300+-	3.42953	13.21351+-	1.14590	.96+-	.14	SI
15	P			<	.00000	<	.02556	.00669+-	.01107	.00+-	.00	P
16	S	*		1.14240+-	.13100	1.88408+-	.28699	1.08868+-	.07991	.95+-	.13	S
17	CL			.03510+-	.01100	.05789+-	.01905	.02409+-	.00561	.69+-	.27	CL
19	K	*		1.29270+-	.14540	2.13196+-	.32124	1.65374+-	.15523	1.28+-	.19	K
20	CA	*		2.68450+-	.30130	4.42735+-	.66632	2.91173+-	.18288	1.08+-	.14	CA
22	TI	*		.37950+-	.08580	.62588+-	.15479	.46948+-	.04389	1.24+-	.30	TI
23	V			<	.02150	<	.03596	.00874+-	.00371	.41+-	.45	V
24	CR			<	.00000	<	.00181	.00401+-	.00090	.00+-	.00	CR
25	MN	*		.06660+-	.00760	.10984+-	.01669	.04655+-	.00380	.70+-	.10	MN
26	FE	*		3.53820+-	.39720	5.83530+-	.87831	2.92914+-	.25360	.83+-	.12	FE
28	NI			<	.00060	<	.00116	.00573+-	.00474	9.55+-	13.66	NI
29	CU			1.03060+-	.11580	1.69970+-	.25596	.49812+-	.03740	.48+-	.07	CU
30	ZN	*		.07380+-	.00990	.12171+-	.02038	.06687+-	.00894	.91+-	.17	ZN
31	GA			<	.00000	<	.00082	.00036+-	.00080	.00+-	.00	GA
33	AS	*		.02300+-	.00540	.03793+-	.00968	.04190+-	.00942	1.82+-	.59	AS
34	SE			.00240+-	.00050	.00396+-	.00092	.00015+-	.00115	.06+-	.48	SE
35	BR	*		.00540+-	.00080	.00891+-	.00159	.00137+-	.00804	.25+-	1.49	BR
37	RB			.00960+-	.00120	.01583+-	.00254	.00922+-	.00084	.96+-	.15	RB
38	SR			.02070+-	.00240	.03414+-	.00523	.01309+-	.00101	.63+-	.09	SR
39	Y			.00090+-	.00090	.00148+-	.00149	.00285+-	.00069	3.16+-	3.26	Y
40	ZR			<	.00000	<	.00610	.00095+-	.00210	.00+-	.00	ZR
42	MO			.02160+-	.00340	.03562+-	.00665	.01377+-	.00153	.64+-	.12	MO
46	PD			<	.00000	<	.00363	.00000+-	.00117	.00+-	.00	PD
47	AG			<	.00000	<	.00495	.00000+-	.00159	.00+-	.00	AG
48	CD			<	.00000	<	.00610	.00201+-	.00218	.00+-	.00	CD
49	IN			<	.00000	<	.00742	.00176+-	.00253	.00+-	.00	IN
50	SN			<	.00000	<	.00924	.00303+-	.00294	.00+-	.00	SN
51	SB			<	.00000	<	.01963	.00656+-	.00675	.00+-	.00	SB
56	BA			<	.00000	<	.03595	.00000+-	.01252	.00+-	.00	BA
57	LA			<	.00000	<	.06498	.00851+-	.02144	.00+-	.00	LA
80	HG			<	.00000	<	.00066	.00006+-	.00074	.00+-	.00	HG
82	PB	*		.05880+-	.00740	.09697+-	.01560	.04730+-	.00719	.80+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.9+- 1.2 COARSE: 60.6+- 6.1 TOTAL: 71.5+- 6.2

RESULTS FOR CMB SITE: HD 791 792 YEAR: 87 DATE: 0130
TOTAL PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
RESULTS DERIVED FROM FINE AND COARSE SAMPLES
R-SQUARE: .9625
CHI SQUARE: 2.0856
DF: 8

#	TYPE	UG/M3		%	
5	5095	1.592+-	.352	2.225+-	.529
7	GYPSU	4.338+-	.864	6.064+-	1.317
13	KNECT	12.140+-	3.297	16.971+-	4.837
19	SSFF2	.444+-	.066	.620+-	.107
21	2NCD2	.772+-	.075	1.079+-	.141
28	OUSTO	49.755+-	3.653	69.556+-	7.893
	TOTAL:	69.041+-	3.356	96.516+-	9.579

SPECIES		INCL	MISS FLG	TOTAL SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			71.53310+-	6.18987	100.00000+-	12.23742	69.04090+-	3.35601	.97+-	.10	TOTAL
13	AL		*	3.82090+-	.41635	5.34144+-	.74323	4.16320+-	.30775	1.09+-	.14	AL
14	SI		*	15.95350+-	1.56938	22.30227+-	2.92192	15.43088+-	1.16716	.97+-	.12	SI
15	P			<	.01920	<	.03468	.00896+-	.01134	.47+-	.84	P
16	S		*	1.75320+-	.14963	2.45089+-	.29788	1.69948+-	.08541	.97+-	.10	S
17	CL			.05690+-	.01268	.07954+-	.01901	.02409+-	.00638	.42+-	.15	CL
19	K		*	1.46100+-	.14668	2.04241+-	.27070	1.83689+-	.15629	1.26+-	.17	K
20	CA		*	2.97670+-	.30310	4.16129+-	.55606	3.20393+-	.18427	1.08+-	.13	CA
22	TI		*	.43120+-	.08601	.60280+-	.13106	.50579+-	.04404	1.17+-	.26	TI
23	V			.02240+-	.02172	.03131+-	.03048	.00926+-	.00374	.41+-	.43	V
24	CR			<	.00000	<	.00182	.00422+-	.00091	.00+-	.00	CR
25	MN		*	.06880+-	.00767	.09618+-	.01357	.05151+-	.00383	.75+-	.10	MN
26	FE		*	3.95070+-	.39990	5.52290+-	.73547	3.22518+-	.25532	.82+-	.10	FE
28	NI			.00160+-	.00086	.00224+-	.00122	.00639+-	.00478	3.99+-	3.68	NI
29	CU			1.18020+-	.11703	1.64987+-	.21713	.54401+-	.03763	.46+-	.06	CU
30	ZN		*	.13920+-	.01242	.19460+-	.02419	.13664+-	.01122	.98+-	.12	ZN
31	GA			<	.00000	<	.00132	.00074+-	.00102	.00+-	.00	GA
33	AS		*	.11860+-	.01585	.16580+-	.02639	.11190+-	.01457	.94+-	.18	AS
34	SE			.01690+-	.00187	.02363+-	.00332	.00015+-	.00134	.01+-	.08	SE
35	BR		*	.00810+-	.00188	.01132+-	.00280	.00137+-	.00970	.17+-	1.20	BR
37	RB			.00970+-	.00144	.01356+-	.00233	.00984+-	.00086	1.01+-	.17	RB
38	SR			.02230+-	.00260	.03117+-	.00453	.01410+-	.00102	.63+-	.09	SR
39	Y			<	.00090	<	.00221	.00360+-	.00094	4.00+-	7.11	Y
40	ZR			<	.00000	<	.00870	.00109+-	.00225	.00+-	.00	ZR
42	MO			.02160+-	.00502	.03020+-	.00749	.01429+-	.00160	.66+-	.17	MO
46	PD			<	.00000	<	.00543	.00000+-	.00127	.00+-	.00	PD
47	AG			<	.00000	<	.00710	.00046+-	.00168	.00+-	.00	AG
48	CD			<	.00000	<	.00927	.00966+-	.00245	.00+-	.00	CD
49	IN			<	.00000	<	.01140	.00203+-	.00273	.00+-	.00	IN
50	SN			<	.00000	<	.01400	.00579+-	.00319	.00+-	.00	SN
51	SB			<	.00000	<	.03075	.01796+-	.00733	.00+-	.00	SB
56	BA			<	.00000	<	.05634	.00000+-	.01341	.00+-	.00	BA
57	LA			<	.00000	<	.10305	.00851+-	.02345	.00+-	.00	LA
80	HG			<	.00030	<	.00101	.00006+-	.00083	.20+-	2.81	HG
82	PB		*	.24210+-	.02208	.33844+-	.04255	.23993+-	.02051	.99+-	.12	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.9+- 1.2 COARSE: 60.6+- 6.1 TOTAL: 71.5+- 6.2

RESULTS FOR CME SITE: GR 787 788 YEAR: 87 DATE: 0130
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24
R-SQUARE: .9926
CHI SQUARE: .5167
DF: 7

#	TYPE	UG/M3		%	
5	5095	1.851+-	.403	18.285+-	4.440
7	GYPSU	.511+-	.120	5.048+-	1.308
21	2NCD2	.976+-	.126	9.642+-	1.624
27	COMPR	.875+-	.568	8.642+-	5.687
28	DUSTO	4.828+-	.458	47.688+-	6.856
	TOTAL:	9.041+-	.489	89.304+-	10.782

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO		
1	TOTAL			10.12350+-	1.09280	100.00000+-	15.26599	9.04071+-	.48897	.89+-	.11	TOTAL
13	AL	*		.56180+-	.06950	5.54946+-	.91114	.51308+-	.04864	.91+-	.14	AL
14	SI	*		1.74880+-	.19910	17.27466+-	2.71021	1.90243+-	.18022	1.09+-	.16	SI
15	P			<	.00000	<	.04840	.00224+-	.00226	.00+-	.00	P
16	S	*		.66250+-	.07930	6.54418+-	1.05481	.66250+-	.03248	1.00+-	.13	S
17	CL			.01360+-	.00560	.13434+-	.05719	.00000+-	.00373	.00+-	.27	CL
19	K	*		.15310+-	.01760	1.51232+-	.23849	.15516+-	.01478	1.01+-	.15	K
20	CA	*		.20290+-	.02300	2.00425+-	.31373	.20290+-	.01410	1.00+-	.13	CA
22	TI	*		.03470+-	.00410	.34277+-	.05486	.03070+-	.00295	.88+-	.13	TI
23	V			.00180+-	.00070	.01778+-	.00718	.00048+-	.00040	.27+-	.25	V
24	CR			<	.00000	<	.00395	.00031+-	.00015	.00+-	.00	CR
25	MN	*		.00370+-	.00070	.03655+-	.00796	.00450+-	.00041	1.22+-	.26	MN
26	FE	*		.33870+-	.03810	3.34568+-	.52161	.32679+-	.02550	.96+-	.13	FE
28	NI			.00090+-	.00030	.00889+-	.00311	.00120+-	.00086	1.34+-	1.05	NI
29	CU			.13540+-	.01520	1.33748+-	.20830	.16676+-	.01320	1.23+-	.17	CU
30	ZN	*		.10650+-	.01200	1.05201+-	.16416	.10066+-	.00868	.95+-	.13	ZN
31	GA			<	.00070	<	.00892	.00048+-	.00080	.68+-	1.44	GA
33	AS	*		.10990+-	.01840	1.08559+-	.21626	.09301+-	.01414	.85+-	.19	AS
34	SE			.00980+-	.00120	.09680+-	.01580	.00000+-	.00088	.00+-	.09	SE
35	BR	*		<	.00150	<	.02081	.00036+-	.00687	.24+-	4.59	BR
37	RB			<	.00000	<	.00494	.00057+-	.00015	.00+-	.00	RB
38	SR			.00140+-	.00060	.01383+-	.00611	.00088+-	.00015	.63+-	.29	SR
39	Y			<	.00000	<	.01087	.00074+-	.00078	.00+-	.00	Y
40	ZR			<	.00000	<	.02865	.00018+-	.00071	.00+-	.00	ZR
42	MO			<	.00000	<	.01877	.00221+-	.00041	.00+-	.00	MO
46	PD			<	.00000	<	.01679	.00000+-	.00040	.00+-	.00	PD
47	AG			<	.00000	<	.02371	.00085+-	.00047	.00+-	.00	AG
48	CD			<	.00000	<	.03161	.01041+-	.00119	.00+-	.00	CD
49	IN			<	.00000	<	.03852	.00034+-	.00086	.00+-	.00	IN
50	SN			<	.00000	<	.04544	.00349+-	.00107	.00+-	.00	SN
51	SB			.02210+-	.01130	.21830+-	.11408	.01442+-	.00266	.65+-	.35	SB
56	BA			<	.00000	<	.18768	.00000+-	.00398	.00+-	.00	BA
57	LA			<	.00000	<	.33980	.00000+-	.00783	.00+-	.00	LA
80	HG			.00080+-	.00040	.00790+-	.00404	.00000+-	.00046	.00+-	.57	HG
82	PB	*		.24260+-	.02730	2.39640+-	.37368	.27039+-	.02443	1.11+-	.16	PB

MEASURED AMBIENT MASS (UG/M3): FINE: 10.1+- 1.1 COARSE: 118.4+-11.8 TOTAL: 128.5+-11.9

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 591 590 YEAR: 86 DATE: 1122
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	3.191 +-	.428	22.242 +-	3.773	.000 +-	.000	.000 +-	.000	3.191 +-	.428	4.503 +-	.710
CAO	.000 +-	.000	.000 +-	.000	6.737 +-	2.032	11.920 +-	3.790	6.737 +-	2.032	9.506 +-	2.974
GYPSU	.000 +-	.000	.000 +-	.000	4.441 +-	.818	7.858 +-	1.649	4.441 +-	.818	6.267 +-	1.266
TRANS	.884 +-	.455	6.159 +-	3.232	.000 +-	.000	.000 +-	.000	.884 +-	.455	1.247 +-	.650
KNECT	6.094 +-	.416	42.470 +-	5.282	28.773 +-	6.083	50.909 +-	11.916	34.867 +-	6.098	49.200 +-	9.520
2NCD3	.324 +-	.050	2.260 +-	.422	.000 +-	.000	.000 +-	.000	.324 +-	.050	.457 +-	.080
DUSTO	.000 +-	.000	.000 +-	.000	9.944 +-	3.078	17.595 +-	5.725	9.944 +-	3.078	14.032 +-	4.495
CONCO	.000 +-	.000	.000 +-	.000	.049 +-	.013	.086 +-	.025	.049 +-	.013	.069 +-	.019
CALC.MASS	10.493 +-	.662	73.132 +-	8.889	49.944 +-	3.213	88.368 +-	10.538	60.437 +-	3.281	85.283 +-	.023
MEAS.MASS	14.348 +-	1.491			56.518 +-	5.675			70.867 +-	5.867		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 595 594 YEAR: 86 DATE: 1122
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	3.880 +-	.505	23.989 +-	3.986	.000 +-	.000	.000 +-	.000	3.880 +-	.505	5.372 +-	.825
GYPSU	.000 +-	.000	.000 +-	.000	1.774 +-	.537	3.165 +-	1.009	1.774 +-	.537	2.457 +-	.769
CANDR	.000 +-	.000	.000 +-	.000	1.941 +-	.539	3.463 +-	1.022	1.941 +-	.539	2.687 +-	.777
KNECT	.784 +-	.226	4.849 +-	1.482	.000 +-	.000	.000 +-	.000	.784 +-	.226	1.086 +-	.325
DUSTO	6.192 +-	.495	38.286 +-	4.996	35.368 +-	5.107	63.106 +-	11.096	41.560 +-	5.131	57.548 +-	8.504
CONCO	.563 +-	.059	3.480 +-	.510	.034 +-	.024	.061 +-	.044	.597 +-	.063	.827 +-	.111
CALC.MASS	11.419 +-	.655	70.604 +-	8.330	39.117 +-	4.791	69.796 +-	11.051	50.535 +-	4.836	69.977 +-	.031
MEAS.MASS	16.173 +-	1.667			56.045 +-	5.623			72.218 +-	5.865		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 597 596 YEAR: 86 DATE: 1201
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	4.375 +-	.625	18.491 +-	3.241	.000 +-	.000	.000 +-	.000	4.375 +-	.625	4.407 +-	.721
GYPSU	.000 +-	.000	.000 +-	.000	2.584 +-	.839	3.417 +-	1.162	2.584 +-	.839	2.603 +-	.871
KNECT	2.307 +-	.572	9.751 +-	2.613	23.550 +-	4.723	31.144 +-	6.982	25.857 +-	4.758	26.045 +-	5.226
SSFF1	.000 +-	.000	.000 +-	.000	.238 +-	.046	.315 +-	.068	.238 +-	.046	.240 +-	.050
2NCD3	1.030 +-	.106	4.355 +-	.629	.000 +-	.000	.000 +-	.000	1.030 +-	.106	1.038 +-	.135
DUSTO	14.706 +-	1.099	62.158 +-	7.839	56.223 +-	4.963	74.352 +-	9.927	70.929 +-	5.083	71.446 +-	7.676
CALC.MASS	22.419 +-	1.115	94.755 +-	10.718	82.595 +-	4.612	109.228 +-	12.526	105.013 +-	4.745	105.779 +-	.038
MEAS.MASS	23.660 +-	2.404			75.617 +-	7.574			99.277 +-	7.946		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 603 602 YEAR: 86 DATE: 1201
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	3.893 +-	.595	13.918 +-	2.548	.000 +-	.000	.000 +-	.000	3.893 +-	.595	2.430 +-	.424
KNECT	1.462 +-	.557	5.229 +-	2.061	13.043 +-	3.539	9.863 +-	2.852	14.505 +-	3.583	9.054 +-	2.363
SSFF1	.120 +-	.078	.429 +-	.281	.224 +-	.049	.169 +-	.041	.344 +-	.092	.215 +-	.060
2NCD3	.804 +-	.174	2.875 +-	.687	.000 +-	.000	.000 +-	.000	.804 +-	.174	.502 +-	.11
DUSTO	20.996 +-	1.481	75.073 +-	9.240	118.902 +-	8.179	89.915 +-	10.902	139.897 +-	8.312	87.324 +-	9.00
CALC.MASS	27.275 +-	1.388	97.524 +-	11.019	132.169 +-	7.302	99.947 +-	11.405	159.443 +-	7.432	99.524 +-	.022
MEAS.MASS	27.967 +-	2.821			132.238 +-	13.203			160.205 +-	13.501		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 609 608 YEAR: 86 DATE: 1204
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	7.045 +-	.969	22.013 +-	3.756	.000 +-	.000	.000 +-	.000	7.045 +-	.969	5.548 +-	.881
GYPSU	.000 +-	.000	.000 +-	.000	1.385 +-	.776	1.458 +-	.830	1.385 +-	.776	1.091 +-	.617
KNECT	4.875 +-	1.040	15.231 +-	3.593	36.923 +-	6.072	38.876 +-	7.485	41.798 +-	6.160	32.916 +-	5.506
2NCD2	.190 +-	.024	.594 +-	.096	.000 +-	.000	.000 +-	.000	.190 +-	.024	.150 +-	.022
SLPR#	.000 +-	.000	.000 +-	.000	.038 +-	.012	.040 +-	.013	.038 +-	.012	.030 +-	.010
DUSTO	21.666 +-	1.744	67.695 +-	8.737	60.235 +-	5.719	63.421 +-	8.751	81.901 +-	5.979	64.498 +-	6.942
CALC.MASS	33.776 +-	1.787	105.532 +-	12.021	98.581 +-	5.455	103.795 +-	11.875	132.357 +-	5.740	104.233 +-	.008
MEAS.MASS	32.005 +-	3.229			94.977 +-	9.511			126.982 +-	10.044		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 605 604 YEAR: 86 DATE: 1204
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	6.616 +-	.912	23.835 +-	4.075	.000 +-	.000	.000 +-	.000	6.616 +-	.912	4.486 +-	.723
TRANS	.988 +-	.275	3.559 +-	1.053	.000 +-	.000	.000 +-	.000	.988 +-	.275	.670 +-	.194
KNECT	2.664 +-	.689	9.596 +-	2.664	18.145 +-	3.982	15.155 +-	3.656	20.808 +-	4.041	14.109 +-	2.982
SSFF1	.058 +-	.012	.209 +-	.049	.000 +-	.000	.000 +-	.000	.058 +-	.012	.039 +-	.009
DUSTO	18.741 +-	1.463	67.511 +-	8.627	107.260 +-	7.545	89.586 +-	10.964	126.001 +-	7.686	85.431 +-	8.834
CALC.MASS	29.067 +-	1.563	104.710 +-	11.998	125.405 +-	6.683	104.741 +-	11.882	154.472 +-	6.864	104.735 +-	.005
MEAS.MASS	27.760 +-	2.809			119.728 +-	11.990			147.488 +-	12.314		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 619 618 YEAR: 86 DATE: 1209
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	3.342 +-	.416	34.704 +-	5.737	.000 +-	.000	.000 +-	.000	3.342 +-	.416	14.560 +-	2.123
GYPSU	.000 +-	.000	.000 +-	.000	.689 +-	.194	5.174 +-	1.551	.689 +-	.194	3.004 +-	.874
KNECT	.245 +-	.069	2.546 +-	.768	4.773 +-	.931	35.822 +-	7.933	5.019 +-	.934	21.862 +-	4.395
SSFF1	.000 +-	.000	.000 +-	.000	.088 +-	.015	.658 +-	.130	.088 +-	.015	.382 +-	.070
2NCD2	.226 +-	.022	2.344 +-	.345	.000 +-	.000	.000 +-	.000	.226 +-	.022	.983 +-	.123
DUSTO	1.792 +-	.147	18.606 +-	2.540	8.305 +-	.816	62.330 +-	8.951	10.097 +-	.829	43.986 +-	4.923
CALC.MASS	5.605 +-	.434	58.201 +-	7.780	13.856 +-	.777	103.984 +-	12.358	19.461 +-	.890	84.777 +-	.035
MEAS.MASS	9.631 +-	1.049			13.325 +-	1.396			22.956 +-	1.746		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 675 674 YEAR: 86 DATE: 1218
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	4.788 +-	.592	44.186 +-	7.230	1.206 +-	.217	8.231 +-	1.709	5.994 +-	.630	23.513 +-	3.039
KNECT	.449 +-	.099	4.139 +-	1.016	8.017 +-	1.150	54.692 +-	9.689	8.465 +-	1.154	33.205 +-	5.170
MTFF2	.190 +-	.059	1.755 +-	.573	.025 +-	.015	.168 +-	.107	.215 +-	.061	.843 +-	.246
DUSTO	1.851 +-	.160	17.086 +-	2.355	6.590 +-	.863	44.961 +-	7.519	8.442 +-	.878	33.113 +-	4.249
CONCO	.317 +-	.090	2.926 +-	.888	.087 +-	.020	.596 +-	.150	.404 +-	.092	1.586 +-	.381
CALC.MASS	7.595 +-	.609	70.091 +-	9.385	15.925 +-	.871	108.648 +-	12.766	23.520 +-	1.063	92.260 +-	.090
MEAS.MASS	10.836 +-	1.162			14.658 +-	1.524			25.493 +-	1.916		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 679 678 YEAR: 86 DATE: 1218
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	4.027 +-	.547	34.470 +-	5.938	.000 +-	.000	.000 +-	.000	4.027 +-	.547	8.580 +-	1.352
GYPSU	.332 +-	.091	2.842 +-	.831	1.424 +-	.481	4.040 +-	1.424	1.756 +-	.490	3.742 +-	1.085
KNECT	.000 +-	.000	.000 +-	.000	2.778 +-	1.473	7.879 +-	4.254	2.778 +-	1.473	5.918 +-	3.175
MTFF1	.146 +-	.043	1.253 +-	.392	.000 +-	.000	.000 +-	.000	.146 +-	.043	.312 +-	.095
2NCD3	.262 +-	.062	2.241 +-	.585	.201 +-	.035	.569 +-	.116	.462 +-	.072	.985 +-	.172
DUSTO	5.374 +-	.348	46.000 +-	5.710	34.282 +-	2.475	97.246 +-	12.036	39.655 +-	2.500	84.491 +-	8.604
CALC.MASS	10.141 +-	.635	86.807 +-	10.683	38.684 +-	2.272	109.734 +-	12.775	48.825 +-	2.359	104.028 +-	.042
MEAS.MASS	11.682 +-	1.238			35.253 +-	3.544			46.935 +-	3.754		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 687 686 YEAR: 86 DATE: 1224
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3			FINE %			COARSE UG/M3			COARSE %			TOTAL UG/M3			TOTAL %		
5095	5.068	+-	.671	38.704	+-	6.532	.000	+-	.000	.000	+-	.000	5.068	+-	.671	11.158	+-	1.713
GYPSU	.487	+-	.090	3.719	+-	.787	1.615	+-	.403	4.998	+-	1.343	2.102	+-	.412	4.629	+-	.977
KNECT	.000	+-	.000	.000	+-	.000	24.238	+-	3.246	74.985	+-	12.560	24.238	+-	3.246	53.367	+-	8.262
2NCD3	.465	+-	.049	3.553	+-	.528	.179	+-	.032	.553	+-	.113	.644	+-	.058	1.418	+-	.169
DUSTO	2.526	+-	.173	19.290	+-	2.413	6.071	+-	1.762	18.782	+-	5.770	8.597	+-	1.771	18.928	+-	4.167
CALC.MASS	8.545	+-	.689	65.265	+-	8.621	32.103	+-	2.037	99.318	+-	11.816	40.649	+-	2.151	89.501	+-	.052
MEAS.MASS	13.093	+-	1.370				32.324	+-	3.253				45.417	+-	3.530			

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 689 688 YEAR: 86 DATE: 1224
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3			FINE %			COARSE UG/M3			COARSE %			TOTAL UG/M3			TOTAL %		
5095	5.080	+-	.657	37.932	+-	6.303	.000	+-	.000	.000	+-	.000	5.080	+-	.657	11.811	+-	1.775
GYPSU	.000	+-	.000	.000	+-	.000	1.572	+-	.327	5.307	+-	1.226	1.572	+-	.327	3.654	+-	.810
TRANS	1.507	+-	.517	11.255	+-	4.037	.000	+-	.000	.000	+-	.000	1.507	+-	.517	3.505	+-	1.232
2NCD3	.256	+-	.052	1.912	+-	.435	.135	+-	.044	.457	+-	.157	.391	+-	.068	.910	+-	.173
COMPR	.000	+-	.000	.000	+-	.000	.426	+-	.289	1.438	+-	.987	.426	+-	.289	.990	+-	.676
DUSTO	3.367	+-	.225	25.142	+-	3.117	28.224	+-	1.893	95.280	+-	11.536	31.591	+-	1.907	73.441	+-	7.165
CALC.MASS	10.211	+-	.775	76.241	+-	9.844	30.357	+-	1.797	102.481	+-	11.979	40.568	+-	1.957	94.311	+-	.045
MEAS.MASS	13.394	+-	1.399				29.622	+-	2.986				43.016	+-	3.297			

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 701 700 YEAR: 86 DATE: 1228
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3			FINE %			COARSE UG/M3			COARSE %			TOTAL UG/M3			TOTAL %		
5095	5.168	+-	.657	46.630	+-	7.745	.000	+-	.000	.000	+-	.000	5.168	+-	.657	4.713	+-	.736
GYPSU	.225	+-	.053	2.027	+-	.522	2.145	+-	.706	2.176	+-	.748	2.370	+-	.708	2.161	+-	.674
SSFF1	.000	+-	.000	.000	+-	.000	.422	+-	.065	.429	+-	.079	.422	+-	.065	.385	+-	.069
MTFF1	.861	+-	.077	7.764	+-	1.083	.000	+-	.000	.000	+-	.000	.861	+-	.077	.785	+-	.100
DUSTO	2.119	+-	.152	19.117	+-	2.458	88.847	+-	5.833	90.124	+-	10.788	90.966	+-	5.835	82.948	+-	9.209
CALC.MASS	8.372	+-	.675	75.538	+-	10.110	91.415	+-	5.575	92.729	+-	10.868	99.787	+-	5.615	90.991	+-	.023
MEAS.MASS	11.083	+-	1.184				98.583	+-	9.867				109.667	+-	9.938			

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 703 702 YEAR: 86 DATE: 1229
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	5.021 +-	.674	35.072 +-	5.961	.000 +-	.000	.000 +-	.000	5.021 +-	.674	2.130 +-	.349
CAO	.000 +-	.000	.000 +-	.000	3.866 +-	.969	1.747 +-	.471	3.866 +-	.969	1.641 +-	.439
GYPSU	.377 +-	.094	2.633 +-	.711	.000 +-	.000	.000 +-	.000	.377 +-	.094	.160 +-	.043
COMPR	.000 +-	.000	.000 +-	.000	2.779 +-	.477	1.255 +-	.249	2.779 +-	.477	1.179 +-	.231
DUSTO	5.049 +-	.329	35.268 +-	4.335	174.284 +-	11.344	78.738 +-	9.399	179.333 +-	11.349	76.097 +-	8.635
CONCO	1.097 +-	.105	7.666 +-	1.087	.000 +-	.000	.000 +-	.000	1.097 +-	.105	.466 +-	.063
CALC.MASS	11.544 +-	.746	80.639 +-	9.889	180.930 +-	11.082	81.740 +-	9.590	192.474 +-	11.107	81.673 +-	.016
MEAS.MASS	14.316 +-	1.492			221.348 +-	22.148			235.663 +-	22.198		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HO 715 714 YEAR: 87 DATE: 0104
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	4.629 +-	.602	33.985 +-	5.673	.000 +-	.000	.000 +-	.000	4.629 +-	.602	9.634 +-	1.461
GYPSU	.000 +-	.000	.000 +-	.000	1.945 +-	.481	5.651 +-	1.509	1.945 +-	.481	4.049 +-	1.050
KNECT	1.167 +-	.268	8.572 +-	2.160	8.833 +-	2.067	25.658 +-	6.538	10.000 +-	2.085	20.815 +-	4.633
SSFF1	.494 +-	.112	3.624 +-	.905	.000 +-	.000	.000 +-	.000	.494 +-	.112	1.027 +-	.246
SSFF2	.000 +-	.000	.000 +-	.000	.176 +-	.032	.510 +-	.106	.176 +-	.032	.365 +-	.072
2NCO3	.456 +-	.177	3.350 +-	1.347	.000 +-	.000	.000 +-	.000	.456 +-	.177	.950 +-	.376
DUSTO	5.884 +-	.462	43.207 +-	5.653	22.818 +-	2.034	66.280 +-	8.917	28.702 +-	2.085	59.740 +-	6.371
CALC.MASS	12.630 +-	.723	92.739 +-	11.067	33.772 +-	1.855	98.098 +-	11.260	46.402 +-	1.991	96.579 +-	.067
MEAS.MASS	13.619 +-	1.426			34.426 +-	3.470			48.045 +-	3.751		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HO 751 750 YEAR: 87 DATE: 0107
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	3.858 +-	.576	33.729 +-	6.182	.000 +-	.000	.000 +-	.000	3.858 +-	.576	11.311 +-	1.897
GYPSU	.000 +-	.000	.000 +-	.000	1.684 +-	.353	7.428 +-	1.729	1.684 +-	.353	4.937 +-	1.100
TRANS	1.454 +-	.520	12.711 +-	4.745	.000 +-	.000	.000 +-	.000	1.454 +-	.520	4.263 +-	1.560
KNECT	.339 +-	.119	2.965 +-	1.091	7.608 +-	1.638	33.562 +-	7.989	7.947 +-	1.642	23.301 +-	5.133
SSFF2	.251 +-	.043	2.190 +-	.442	.170 +-	.026	.751 +-	.139	.421 +-	.050	1.234 +-	.175
CHORM	.716 +-	.237	6.263 +-	2.178	.000 +-	.000	.000 +-	.000	.716 +-	.237	2.100 +-	.714
DUSTO	2.904 +-	.272	25.390 +-	3.596	10.812 +-	1.268	47.695 +-	7.399	13.716 +-	1.297	40.215 +-	4.886
CALC.MASS	9.522 +-	.713	83.248 +-	10.818	20.274 +-	1.115	89.435 +-	10.328	29.796 +-	1.323	87.360 +-	.043
MEAS.MASS	11.438 +-	1.215			22.669 +-	2.302			34.107 +-	2.603		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 755 754 YEAR: 87 DATE: 0107
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE				COARSE				TOTAL			
	UG/M3		%		UG/M3		%		UG/M3		%	
5095	3.398 +-	.446	34.598 +-	5.889	.000 +-	.000	.000 +-	.000	3.398 +-	.446	5.462 +-	.857
GYPSU	.110 +-	.039	1.123 +-	.413	1.384 +-	.381	2.641 +-	.774	1.494 +-	.383	2.401 +-	.650
TRANS	.796 +-	.348	8.104 +-	3.646	.000 +-	.000	.000 +-	.000	.796 +-	.348	1.279 +-	.569
SSFF2	.209 +-	.026	2.126 +-	.354	.000 +-	.000	.000 +-	.000	.209 +-	.026	.336 +-	.05
SLPR2	.000 +-	.000	.000 +-	.000	.064 +-	.012	.121 +-	.026	.064 +-	.012	.102 +-	.02
CHORM	.000 +-	.000	.000 +-	.000	.206 +-	.134	.394 +-	.259	.206 +-	.134	.332 +-	.218
DUSTO	2.047 +-	.146	20.843 +-	2.708	43.289 +-	2.871	82.623 +-	9.928	45.336 +-	2.875	72.870 +-	7.792
CALC.MASS	6.560 +-	.535	66.794 +-	9.063	44.942 +-	2.740	85.779 +-	10.061	51.502 +-	2.792	82.782 +-	.01
MEAS.MASS	9.821 +-	1.066			52.393 +-	5.249			62.214 +-	5.356		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 761 760 YEAR: 87 DATE: 0111
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE				COARSE				TOTAL			
	UG/M3		%		UG/M3		%		UG/M3		%	
5095	1.711 +-	.254	27.659 +-	5.296	.000 +-	.000	.000 +-	.000	1.711 +-	.254	4.980 +-	.855
GYPSU	.261 +-	.051	4.223 +-	.966	2.532 +-	.349	8.990 +-	1.535	2.793 +-	.352	8.132 +-	1.24
SLPR#	.000 +-	.000	.000 +-	.000	.035 +-	.007	.124 +-	.028	.035 +-	.007	.102 +-	.02
SLPR2	.328 +-	.033	5.311 +-	.838	.000 +-	.000	.000 +-	.000	.328 +-	.033	.956 +-	.12
DUSTO	1.499 +-	.111	24.241 +-	3.432	19.002 +-	1.267	67.465 +-	8.163	20.501 +-	1.271	59.683 +-	6.308
CALC.MASS	3.800 +-	.275	61.434 +-	8.636	21.569 +-	1.251	76.579 +-	8.917	25.368 +-	1.280	73.852 +-	.05
MEAS.MASS	6.185 +-	.746			28.166 +-	2.844			34.350 +-	2.940		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 763 762 YEAR: 87 DATE: 0111
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE				COARSE				TOTAL			
	UG/M3		%		UG/M3		%		UG/M3		%	
5095	2.026 +-	.282	29.949 +-	5.449	.000 +-	.000	.000 +-	.000	2.026 +-	.282	1.598 +-	.270
KNECT	.326 +-	.081	4.814 +-	1.322	.000 +-	.000	.000 +-	.000	.326 +-	.081	.257 +-	.06
CU OR	.000 +-	.000	.000 +-	.000	31.969 +-	7.261	26.639 +-	6.612	31.969 +-	7.261	25.218 +-	6.20
2NCD1	.935 +-	.099	13.821 +-	2.179	.000 +-	.000	.000 +-	.000	.935 +-	.099	.738 +-	.105
SLPR2	.000 +-	.000	.000 +-	.000	.077 +-	.014	.064 +-	.013	.077 +-	.014	.061 +-	.013
DUSTO	1.907 +-	.160	28.193 +-	4.055	48.156 +-	6.833	40.128 +-	6.968	50.064 +-	6.835	39.491 +-	6.567
CALC.MASS	5.194 +-	.328	76.777 +-	10.206	80.203 +-	4.200	66.831 +-	7.550	85.397 +-	4.213	67.362 +-	.023
MEAS.MASS	6.765 +-	.791			120.008 +-	12.013			126.773 +-	12.039		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 767 768 YEAR: 87 DATE: 0112
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	2.456 +-	.337	15.581 +-	2.677	.000 +-	.000	.000 +-	.000	2.456 +-	.337	2.210 +-	.359
CAO	.000 +-	.000	.000 +-	.000	.632 +-	.193	.663 +-	.213	.632 +-	.193	.569 +-	.181
CU OR	.000 +-	.000	.000 +-	.000	37.075 +-	6.879	38.882 +-	8.196	37.075 +-	6.879	33.367 +-	6.839
SSFF2	.000 +-	.000	.000 +-	.000	.208 +-	.037	.218 +-	.045	.208 +-	.037	.187 +-	.037
2NCD2	.720 +-	.071	4.565 +-	.652	.000 +-	.000	.000 +-	.000	.720 +-	.071	.648 +-	.085
DUSTO	4.601 +-	.315	29.193 +-	3.620	27.070 +-	6.541	28.389 +-	7.424	31.671 +-	6.549	28.503 +-	6.395
CALC.MASS	7.776 +-	.457	49.339 +-	5.866	64.985 +-	3.544	68.151 +-	7.766	72.762 +-	3.573	65.483 +-	.024
MEAS.MASS	15.761 +-	1.629			95.355 +-	9.540			111.116 +-	9.679		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 783 784 YEAR: 87 DATE: 0127
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	1.249 +-	.453	11.657 +-	4.408	.000 +-	.000	.000 +-	.000	1.249 +-	.453	2.195 +-	.817
GYPSU	1.501 +-	.252	14.012 +-	2.789	5.405 +-	1.116	11.705 +-	2.687	6.906 +-	1.144	12.139 +-	2.254
KNECT	.000 +-	.000	.000 +-	.000	28.893 +-	4.557	62.566 +-	11.701	28.893 +-	4.557	50.783 +-	9.076
2NCD2	.474 +-	.064	4.420 +-	.761	.000 +-	.000	.000 +-	.000	.474 +-	.064	.832 +-	.132
2NCD3	.000 +-	.000	.000 +-	.000	.144 +-	.035	.313 +-	.082	.144 +-	.035	.254 +-	.065
CHORM	.781 +-	.234	7.291 +-	2.322	1.137 +-	.309	2.463 +-	.713	1.919 +-	.388	3.372 +-	.738
DUSTO	4.137 +-	.313	38.612 +-	5.070	13.743 +-	2.641	29.760 +-	6.454	17.880 +-	2.660	31.427 +-	5.369
CALC.MASS	8.142 +-	.482	75.992 +-	9.315	49.322 +-	2.894	106.805 +-	12.429	57.464 +-	2.934	101.003 +-	.036
MEAS.MASS	10.714 +-	1.150			46.179 +-	4.640			56.894 +-	4.781		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 780 779 YEAR: 87 DATE: 0127
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE UG/M3		FINE %		COARSE UG/M3		COARSE %		TOTAL UG/M3		TOTAL %	
5095	2.818 +-	.387	31.067 +-	5.469	.000 +-	.000	.000 +-	.000	2.818 +-	.387	8.823 +-	1.398
GYPSU	.000 +-	.000	.000 +-	.000	1.680 +-	.521	7.348 +-	2.397	1.680 +-	.521	5.261 +-	1.683
KNECT	1.085 +-	.211	11.958 +-	2.672	3.758 +-	1.414	16.432 +-	6.404	4.843 +-	1.430	15.162 +-	4.634
2NCD3	.000 +-	.000	.000 +-	.000	.173 +-	.039	.758 +-	.187	.173 +-	.039	.543 +-	.130
SLPR2	.704 +-	.068	7.763 +-	1.138	.000 +-	.000	.000 +-	.000	.704 +-	.068	2.205 +-	.275
CHORM	.000 +-	.000	.000 +-	.000	1.012 +-	.206	4.426 +-	1.006	1.012 +-	.206	3.169 +-	.691
DUSTO	3.153 +-	.289	34.754 +-	4.983	15.687 +-	1.303	68.593 +-	9.007	18.840 +-	1.335	58.982 +-	6.271
CALC.MASS	7.760 +-	.462	85.542 +-	10.721	22.311 +-	1.180	97.557 +-	11.181	30.071 +-	1.267	94.145 +-	.108
MEAS.MASS	9.072 +-	1.000			22.869 +-	2.326			31.941 +-	2.532		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 785 786 YEAR: 87 DATE: 0128
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE				COARSE				TOTAL			
	UG/M3		%		UG/M3		%		UG/M3		%	
5095	5.610 +-	.973	29.995 +-	6.045	.000 +-	.000	.000 +-	.000	5.610 +-	.973	7.193 +-	1.374
GYPSU	2.270 +-	.367	12.139 +-	2.324	5.319 +-	1.044	8.971 +-	1.977	7.589 +-	1.106	9.731 +-	1.61[illegible]
KNECT	.000 +-	.000	.000 +-	.000	46.817 +-	6.141	78.966 +-	13.041	46.817 +-	6.141	60.029 +-	9.22[illegible]
SSFF1	.696 +-	.234	3.723 +-	1.310	.000 +-	.000	.000 +-	.000	.696 +-	.234	.893 +-	.30[illegible]
MTFF1	.318 +-	.194	1.699 +-	1.050	.000 +-	.000	.000 +-	.000	.318 +-	.194	.407 +-	.250
SSFF2	.000 +-	.000	.000 +-	.000	.648 +-	.097	1.094 +-	.197	.648 +-	.097	.831 +-	.141
2NCD3	1.161 +-	.364	6.208 +-	2.047	.000 +-	.000	.000 +-	.000	1.161 +-	.364	1.489 +-	.48[illegible]
DUSTO	4.483 +-	.308	23.970 +-	2.962	9.706 +-	3.180	16.371 +-	5.609	14.189 +-	3.194	18.194 +-	4.34[illegible]
CALC.MASS	14.538 +-	1.006	77.734 +-	9.621	62.490 +-	3.940	105.402 +-	12.491	77.028 +-	4.066	98.767 +-	.091
MEAS.MASS	18.702 +-	1.919			59.287 +-	5.949			77.990 +-	6.251		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 781 782 YEAR: 87 DATE: 0128
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE				COARSE				TOTAL			
	UG/M3		%		UG/M3		%		UG/M3		%	
5095	5.973 +-	1.007	28.990 +-	5.713	.000 +-	.000	.000 +-	.000	5.973 +-	1.007	7.204 +-	1.34[illegible]
GYPSU	.987 +-	.203	4.793 +-	1.101	4.257 +-	1.007	6.832 +-	1.756	5.244 +-	1.027	6.325 +-	1.337
KNECT	.000 +-	.000	.000 +-	.000	8.467 +-	3.280	13.588 +-	5.438	8.467 +-	3.280	10.212 +-	4.039
SSFF2	.000 +-	.000	.000 +-	.000	.615 +-	.089	.987 +-	.174	.615 +-	.089	.742 +-	.12[illegible]
2NCD2	1.492 +-	.176	7.244 +-	1.132	.000 +-	.000	.000 +-	.000	1.492 +-	.176	1.800 +-	.25[illegible]
CHORM	1.282 +-	.483	6.221 +-	2.427	.000 +-	.000	.000 +-	.000	1.282 +-	.483	1.546 +-	.59[illegible]
DUSTO	7.678 +-	.577	37.263 +-	4.726	47.841 +-	3.852	76.781 +-	9.878	55.519 +-	3.895	66.961 +-	7.103
CALC.MASS	17.413 +-	1.092	84.512 +-	10.127	61.180 +-	3.491	98.188 +-	11.334	78.593 +-	3.658	94.790 +-	.06[illegible]
MEAS.MASS	20.604 +-	2.104			62.309 +-	6.252			82.913 +-	6.597		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: HD 791 792 YEAR: 87 DATE: 0130
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE				COARSE				TOTAL			
	UG/M3		%		UG/M3		%		UG/M3		%	
5095	1.592 +-	.352	14.604 +-	3.590	.000 +-	.000	.000 +-	.000	1.592 +-	.352	2.225 +-	.529
GYPSU	.896 +-	.173	8.217 +-	1.817	3.442 +-	.846	5.677 +-	1.507	4.338 +-	.864	6.064 +-	1.317
KNECT	.000 +-	.000	.000 +-	.000	12.140 +-	3.297	20.022 +-	5.796	12.140 +-	3.297	16.971 +-	4.837
SSFF2	.000 +-	.000	.000 +-	.000	.444 +-	.066	.732 +-	.132	.444 +-	.066	.620 +-	.107
2NCD2	.772 +-	.075	7.083 +-	1.025	.000 +-	.000	.000 +-	.000	.772 +-	.075	1.079 +-	.141
DUSTO	5.951 +-	.408	54.600 +-	6.926	43.805 +-	3.630	72.244 +-	9.397	49.755 +-	3.653	69.556 +-	7.893
CALC.MASS	9.210 +-	.511	84.504 +-	10.166	59.831 +-	3.317	98.675 +-	11.305	69.041 +-	3.356	96.516 +-	.043
MEAS.MASS	10.899 +-	1.164			60.634 +-	6.080			71.533 +-	6.190		

*** CMB SOURCE CONTRIBUTION SUMMARY ***

RESULTS FOR CMB SITE: GR 787 788 YEAR: 87 DATE: 0130
SAMPLING DURATION: 24 HRS. WITH START HOUR: 24

SOURCE	FINE				COARSE				TOTAL			
	UG/M3		%		UG/M3		%		UG/M3		%	
5095	1.851 +-	.403	18.285 +-	4.440	.000 +-	.000	.000 +-	.000	1.851 +-	.403	1.440 +-	.340
GYPSU	.511 +-	.120	5.048 +-	1.308	4.364 +-	1.093	3.686 +-	.994	4.875 +-	1.100	3.793 +-	.925
SSFF2	.000 +-	.000	.000 +-	.000	.220 +-	.146	.186 +-	.125	.220 +-	.146	.172 +-	.115
2NCD2	.976 +-	.126	9.642 +-	1.624	.000 +-	.000	.000 +-	.000	.976 +-	.126	.759 +-	.121
COMPR	.875 +-	.568	8.642 +-	5.687	3.844 +-	1.051	3.247 +-	.946	4.719 +-	1.195	3.672 +-	.990
DUSTO	4.828 +-	.458	47.688 +-	6.856	101.210 +-	6.809	85.485 +-	10.307	106.038 +-	6.824	82.508 +-	9.302
CALC.MASS	9.041 +-	.489	89.304 +-	10.782	109.639 +-	6.499	92.604 +-	10.770	118.679 +-	6.517	92.344 +-	.034
MEAS.MASS	10.123 +-	1.093			118.395 +-	11.847			128.519 +-	11.897		

APPENDIX C

ELEMENTAL COMPOSITION SOURCE PROFILES

srce code	part size	revsion date	source description	reference author	reference date
5334	FCT	12/26/86	SDGE blrs. #1,2,3 compst., oil	Miller, E.A.	01/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0971 +- .1392	1.0629 +- .5940	.1550 +- .1356
Si	.2627 +- .1521	1.4476 +- .4668	.3338 +- .1457
P	.0255 +- .0315	.0866 +- .0906	.0292 +- .0301
S	11.8576 +- 1.0710	10.7577 +- 3.2266	11.7916 +- 1.0252
Cl	.1444 +- .1219	1.0562 +- .6291	.1991 +- .1206
K	.1490 +- .0676	.1650 +- .1271	.1500 +- .0640
Ca	.6086 +- .1722	.9783 +- .2678	.6308 +- .1627
Ti	.0453 +- .0155	.1284 +- .0653	.0503 +- .0151
V	.5192 +- .1456	.3813 +- .1052	.5109 +- .1370
Cr	.0504 +- .0243	.1638 +- .0606	.0572 +- .0231
Mn	.0174 +- .0072	.1067 +- .0634	.0228 +- .0078
Fe	1.2672 +- .6745	1.2535 +- .6002	1.2664 +- .6351
Ni	1.1149 +- .4246	.7280 +- .1105	1.0917 +- .3992
Cu	.0071 +- .0067	.0211 +- .0344	.0079 +- .0066
Zn	.0998 +- .0302	.0502 +- .0389	.0968 +- .0285
Ga	.0045 +- .0042	.0066 +- .0105	.0046 +- .0040
As	.0249 +- .0076	.0190 +- .0290	.0245 +- .0074
Se	.0022 +- .0023	.0343 +- .0313	.0041 +- .0029
Br	.0013 +- .0019	.0525 +- .0577	.0044 +- .0039
Rb	.0000 +- .0029	.0279 +- .0503	.0017 +- .0041
Sr	.0005 +- .0015	.0212 +- .0411	.0017 +- .0028
Y	.0000 +- .0045	.0293 +- .0567	.0018 +- .0054
Zr	.0062 +- .0133	.0056 +- .0206	.0062 +- .0126
Mo	.0002 +- .0007	.0000 +- .1798	.0002 +- .0108
Pd	.0014 +- .0054	.0962 +- .1446	.0071 +- .0101
Ag	.0054 +- .0071	.2182 +- .2470	.0182 +- .0163
Cd	.0017 +- .0029	.2265 +- .1932	.0152 +- .0119
In	.0026 +- .0051	.2926 +- .2626	.0200 +- .0165
Sn	.0001 +- .0005	.2178 +- .3256	.0132 +- .0195
Sb	.0019 +- .0069	.5983 +- .7701	.0377 +- .0467
Ba	.0000 +- .1341	.9964 +- 1.4486	.0598 +- .1531
La	.0000 +- .2443	1.7284 +- 2.6599	.1037 +- .2797
Hg	.0001 +- .0002	.0194 +- .0176	.0013 +- .0011
Pb	.0319 +- .0143	.1362 +- .1643	.0382 +- .0167
OC	5.0000 +- 2.5000	44.0000 +-16.5000	7.3000 +- 2.6000
EC	12.8000 +- 9.3000	18.7000 +-15.0000	13.2000 +- 8.8000
Sum	34.1511	85.8137	37.2571

srce code	part size	revsion date	source description	reference author	reference date
5345	F T	01/04/87	San Diego trans. composite	Miller, E.A.	01/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Na	.3110 +- .0790		.1850 +- .0500
Mg	.7110 +- .1610		.3870 +- .0870
Al	.5750 +- .1540		.3020 +- .0820
Si	.4090 +- .0860		.2370 +- .0540
P	.0780 +- .1400		.0400 +- .3160
S	3.3140 +- .5930		2.0770 +- .5680
Cl	1.4910 +- .3790		1.5560 +- .6510
K	.0640 +- .0220		.0340 +- .0110
Ca	.7860 +- .1650		.4380 +- .0900
Ti	.0090 +- .0060		.0140 +- .0130
V	.0030 +- .0030		.0010 +- .0020
Cr	.0000 +- .0030		.0000 +- .0020
Mn	.0170 +- .0070		.0090 +- .0040
Fe	.6930 +- .2630		.3630 +- .1420
Ni	.0080 +- .0040		.0040 +- .0020
Cu	.0940 +- .0490		.0480 +- .0240
Zn	.4470 +- .1340		.7220 +- .1010
Se	.0010 +- .0010		.0000 +- .0010
Br	.5780 +- .1960		.3660 +- .1230
Sr	.0060 +- .0040		.0080 +- .0050
Cd	.0170 +- .0100		.0090 +- .0050
Sb	.0100 +- .0460		.0060 +- .0250
Ba	.0790 +- .0480		.0420 +- .0260
Pb	2.3410 +- .6460		1.4630 +- .4030
OC	48.7400 +- 7.2290		53.8310 +-10.3070
EC	29.6900 +- 4.0930		28.7750 +- 6.6110
SO4	9.9280 +- 1.7790		6.2240 +- 1.7050
Sum	*******		97.1410

srce code	part size	revsion date	source description	reference author	reference date
5363	FCI	03/27/87	HAYDEN #1 CANYON DRIVE ROAD D	BADGETT-WEST	02/87

PERCENT COMPOSITION

SPECIES	FINE		COARSE		TOTAL	
Al	9.4917 +-	.9492	7.4449 +-	.3748	7.3858 +-	.6710
Si	27.1881 +-	2.7188	23.0097 +-	1.1512	22.6655 +-	2.0720
P	.1475 +-	.0302	.1035 +-	.0211	.1039 +-	.0190
S	.8415 +-	.0841	.7700 +-	.0467	.7533 +-	.0693
Cl	.1740 +-	.0202	.1378 +-	.0109	.1366 +-	.0124
K	1.3895 +-	.1390	1.5367 +-	.0789	1.4816 +-	.1381
Ca	3.9496 +-	.3950	4.3913 +-	.2211	4.2323 +-	.3946
Ti	.3002 +-	.0300	.3544 +-	.0216	.3402 +-	.0318
V	.0239 +-	.0049	.0178 +-	.0060	.0177 +-	.0054
Cr	.0178 +-	.0024	.0201 +-	.0016	.0194 +-	.0018
Mn	.0880 +-	.0088	.0899 +-	.0049	.0872 +-	.0081
Fe	3.6790 +-	.3679	4.1690 +-	.2104	4.0128 +-	.3746
Ni	.0178 +-	.0024	.0153 +-	.0013	.0150 +-	.0014
Cu	.7095 +-	.0709	.8341 +-	.0423	.8008 +-	.0749
Zn	.0888 +-	.0089	.1031 +-	.0070	.0990 +-	.0093
Ga	.0027 +-	.0015	.0034 +-	.0007	.0033 +-	.0007
As	.0177 +-	.0081	.0145 +-	.0063	.0144 +-	.0057
Se	.0038 +-	.0011	.0016 +-	.0004	.0017 +-	.0004
Br	.0040 +-	.0013	.0055 +-	.0006	.0052 +-	.0006
Rb	.0106 +-	.0019	.0119 +-	.0009	.0114 +-	.0011
Sr	.0348 +-	.0035	.0428 +-	.0024	.0410 +-	.0038
Y	.0118 +-	.0028	.0065 +-	.0010	.0068 +-	.0010
Zr	.0250 +-	.0135	.0092 +-	.0045	.0102 +-	.0042
Mo	.0000 +-	.0078	.0000 +-	.0028	.0000 +-	.0026
Pd	.0076 +-	.0078	.0014 +-	.0022	.0018 +-	.0021
Ag	.0062 +-	.0105	.0000 +-	.0034	.0005 +-	.0031
Cd	.0112 +-	.0137	.0000 +-	.0043	.0008 +-	.0040
In	.0259 +-	.0174	.0098 +-	.0050	.0107 +-	.0047
Sn	.0041 +-	.0201	.0000 +-	.0060	.0003 +-	.0056
Sb	.0000 +-	.0432	.0050 +-	.0127	.0044 +-	.0119
Ba	.0445 +-	.0839	.0000 +-	.0258	.0034 +-	.0240
La	.0484 +-	.1523	.0443 +-	.0431	.0434 +-	.0403
Hg	.0000 +-	.0012	.0007 +-	.0005	.0006 +-	.0004
Pb	.1148 +-	.0115	.1065 +-	.0061	.1041 +-	.0096
Sum	48.4798		43.2607		42.4151	

srce code	part size	revsion date	source description	reference author	reference date
5364	FCT	03/27/87	HAYDEN #2 JAILHOUSE PARKING	BADGETT-WEST	02/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	9.6646 +- .9664	6.1541 +- .6154	6.3756 +- .5798
Si	27.8355 +- 2.7836	19.7096 +- 1.9710	20.2225 +- 1.8549
P	.1547 +- .0318	.0885 +- .0183	.0927 +- .0172
S	.6754 +- .0675	.6185 +- .0619	.6221 +- .0581
Cl	.1884 +- .0205	.1408 +- .0141	.1438 +- .0133
K	1.4240 +- .1424	1.4463 +- .1446	1.4449 +- .1358
Ca	5.6454 +- .5645	5.8842 +- .5884	5.8692 +- .5524
Ti	.3404 +- .0340	.3959 +- .0396	.3924 +- .0372
V	.0301 +- .0054	.0166 +- .0056	.0174 +- .0053
Cr	.0207 +- .0025	.0216 +- .0022	.0216 +- .0020
Mn	.0941 +- .0094	.0931 +- .0093	.0932 +- .0087
Fe	4.4413 +- .4441	4.5499 +- .4550	4.5430 +- .4272
Ni	.0152 +- .0022	.0116 +- .0012	.0118 +- .0011
Cu	1.5496 +- .1549	1.2270 +- .1227	1.2473 +- .1154
Zn	.0930 +- .0103	.0710 +- .0072	.0724 +- .0068
Ga	.0047 +- .0015	.0041 +- .0006	.0041 +- .0006
As	.0122 +- .0090	.0162 +- .0048	.0159 +- .0046
Se	.0011 +- .0009	.0016 +- .0003	.0015 +- .0003
Br	.0048 +- .0013	.0032 +- .0004	.0033 +- .0004
Rb	.0109 +- .0019	.0104 +- .0010	.0104 +- .0010
Sr	.0340 +- .0034	.0399 +- .0040	.0395 +- .0037
Y	.0076 +- .0025	.0069 +- .0009	.0070 +- .0008
Zr	.0000 +- .0125	.0144 +- .0039	.0135 +- .0038
Mo	.0000 +- .0069	.0112 +- .0024	.0105 +- .0023
Pd	.0000 +- .0079	.0021 +- .0018	.0020 +- .0018
Ag	.0144 +- .0101	.0000 +- .0025	.0009 +- .0025
Cd	.0058 +- .0124	.0000 +- .0034	.0004 +- .0033
In	.0166 +- .0156	.0000 +- .0041	.0010 +- .0040
Sn	.0288 +- .0193	.0000 +- .0050	.0018 +- .0049
Sb	.0000 +- .0448	.0169 +- .0108	.0159 +- .0105
Ba	.0000 +- .0752	.0000 +- .0210	.0000 +- .0202
La	.1205 +- .1409	.0711 +- .0357	.0742 +- .0346
Hg	.0031 +- .0015	.0012 +- .0004	.0014 +- .0004
Pb	.1341 +- .0134	.0801 +- .0080	.0835 +- .0075
Sum	52.5711	40.7080	41.4567

srce code	part size	revsion date	source description	reference author	reference date
5365	FCT	03/27/87	HAYDEN #4 GRAVEL ROAD W JAIL	BADGETT-WEST	02/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	7.0826 +- .7083	5.0094 +- .5009	5.1607 +- .4673
Si	19.8722 +- 1.9872	15.6098 +- 1.5610	15.9208 +- 1.4543
P	.0923 +- .0217	.0551 +- .0144	.0578 +- .0134
S	.7021 +- .0702	.6072 +- .0607	.6141 +- .0565
Cl	.1869 +- .0205	.1984 +- .0198	.1975 +- .0185
K	.7935 +- .0793	.8398 +- .0840	.8364 +- .0781
Ca	12.9519 +- 1.2952	12.6729 +- 1.2673	12.6933 +- 1.1786
Ti	.2459 +- .0246	.2629 +- .0263	.2616 +- .0244
V	.0229 +- .0044	.0197 +- .0033	.0199 +- .0030
Cr	.0147 +- .0023	.0146 +- .0015	.0147 +- .0014
Mn	.0886 +- .0089	.0778 +- .0078	.0786 +- .0072
Fe	3.0955 +- .3096	3.1089 +- .3109	3.1079 +- .2891
Ni	.0079 +- .0018	.0086 +- .0009	.0086 +- .0008
Cu	.7433 +- .0743	.6430 +- .0643	.6503 +- .0598
Zn	.0217 +- .0051	.0177 +- .0035	.0180 +- .0033
Ga	.0041 +- .0013	.0030 +- .0005	.0031 +- .0004
As	.0002 +- .0039	.0014 +- .0018	.0013 +- .0017
Se	.0032 +- .0012	.0012 +- .0003	.0014 +- .0003
Br	.0033 +- .0014	.0023 +- .0004	.0024 +- .0004
Rb	.0084 +- .0018	.0067 +- .0007	.0068 +- .0006
Sr	.0279 +- .0028	.0331 +- .0033	.0327 +- .0031
Y	.0093 +- .0028	.0065 +- .0009	.0067 +- .0008
Zr	.0086 +- .0135	.0078 +- .0039	.0079 +- .0038
Mo	.0000 +- .0074	.0000 +- .0023	.0000 +- .0022
Pd	.0127 +- .0083	.0000 +- .0023	.0009 +- .0022
Ag	.0023 +- .0105	.0000 +- .0029	.0002 +- .0028
Cd	.0037 +- .0137	.0000 +- .0038	.0003 +- .0037
In	.0000 +- .0182	.0047 +- .0044	.0044 +- .0043
Sn	.0000 +- .0232	.0068 +- .0054	.0063 +- .0052
Sb	.0000 +- .0442	.0226 +- .0124	.0210 +- .0119
Ba	.0530 +- .0861	.0000 +- .0234	.0039 +- .0226
La	.2549 +- .1610	.0701 +- .0402	.0835 +- .0391
Hg	.0023 +- .0016	.0005 +- .0004	.0007 +- .0004
Pb	.0349 +- .0055	.0249 +- .0025	.0256 +- .0023
Sum	46.3510	39.3374	39.8491

srce code	part size	revsion date	source description	reference author	reference date
5366	FCT	03/27/87	HAYDEN #5 COPPER ORE TAILINGS	BADGETT-WEST	02/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	11.8972 +- 1.1897	10.2743 +- 1.0274	10.4165 +- .9413
Si	24.4426 +- 2.4443	23.3206 +- 2.3321	23.4141 +- 2.1340
P	.2402 +- .0483	.1064 +- .0214	.1184 +- .0199
S	4.6238 +- .4624	1.7706 +- .1771	2.0253 +- .1664
Cl	.1131 +- .0168	.0920 +- .0092	.0938 +- .0085
K	4.0022 +- .4002	3.9318 +- .3932	3.9369 +- .3597
Ca	.2384 +- .0239	.3100 +- .0310	.3035 +- .0283
Ti	.3955 +- .0396	.4364 +- .0436	.4326 +- .0399
V	.0452 +- .0058	.0236 +- .0061	.0255 +- .0056
Cr	.0436 +- .0044	.0264 +- .0026	.0279 +- .0024
Mn	.0522 +- .0052	.0347 +- .0035	.0362 +- .0032
Fe	12.5718 +- 1.2572	6.4233 +- .6423	6.9714 +- .5954
Ni	.0084 +- .0013	.0051 +- .0006	.0054 +- .0005
Cu	.2175 +- .0218	.1232 +- .0123	.1316 +- .0114
Zn	.0136 +- .0022	.0110 +- .0011	.0112 +- .0011
Ga	.0029 +- .0008	.0028 +- .0004	.0028 +- .0004
As	.0000 +- .0027	.0000 +- .0014	.0000 +- .0013
Se	.0026 +- .0007	.0015 +- .0003	.0016 +- .0003
Br	.0031 +- .0009	.0023 +- .0004	.0023 +- .0004
Rb	.0245 +- .0025	.0251 +- .0025	.0251 +- .0023
Sr	.0407 +- .0041	.0255 +- .0026	.0269 +- .0024
Y	.0100 +- .0019	.0101 +- .0010	.0100 +- .0010
Zr	.0000 +- .0086	.0086 +- .0037	.0078 +- .0034
Mo	.0000 +- .0049	.0000 +- .0024	.0000 +- .0022
Pd	.0066 +- .0049	.0030 +- .0020	.0033 +- .0018
Ag	.0047 +- .0064	.0000 +- .0027	.0004 +- .0025
Cd	.0140 +- .0086	.0000 +- .0036	.0013 +- .0033
In	.0186 +- .0106	.0067 +- .0042	.0078 +- .0039
Sn	.0168 +- .0127	.0000 +- .0051	.0015 +- .0048
Sb	.0147 +- .0274	.0102 +- .0110	.0106 +- .0103
Ba	.0986 +- .0527	.0000 +- .0220	.0088 +- .0206
La	.0252 +- .0924	.0659 +- .0371	.0622 +- .0348
Hg	.0011 +- .0009	.0014 +- .0005	.0014 +- .0004
Pb	.0295 +- .0037	.0182 +- .0018	.0192 +- .0017
Sum	59.2192	47.0706	48.1435

srce code	part size	revsion date	source description	reference author	reference date
5367	FCT	03/27/87	HAYDEN #6 COPPER ORE	BADGETT-WEST	02/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	14.0086 +- 1.4008	9.1486 +- .9149	9.4233 +- .8668
Si	32.2022 +- 3.2202	22.6468 +- 2.2647	23.1869 +- 2.1444
P	.2329 +- .0472	.1069 +- .0215	.1140 +- .0205
S	.8819 +- .0882	.6043 +- .0604	.6200 +- .0572
Cl	.1375 +- .0198	.0994 +- .0099	.1016 +- .0094
K	2.6352 +- .2635	2.5082 +- .2508	2.5154 +- .2371
Ca	1.2817 +- .1282	1.3017 +- .1302	1.3006 +- .1230
Ti	.4846 +- .0485	.4944 +- .0494	.4939 +- .0467
V	.0383 +- .0075	.0347 +- .0057	.0349 +- .0054
Cr	.0466 +- .0047	.0283 +- .0028	.0294 +- .0027
Mn	.1282 +- .0128	.0973 +- .0097	.0990 +- .0092
Fe	8.3703 +- .8370	5.7617 +- .5762	5.9091 +- .5457
Ni	.0191 +- .0028	.0122 +- .0012	.0126 +- .0012
Cu	.9455 +- .0945	.9551 +- .0955	.9546 +- .0903
Zn	.0947 +- .0094	.0145 +- .0049	.0190 +- .0047
Ga	.0058 +- .0015	.0051 +- .0006	.0051 +- .0006
As	.0037 +- .0044	.0002 +- .0016	.0004 +- .0016
Se	.0048 +- .0014	.0029 +- .0004	.0030 +- .0004
Br	.0082 +- .0017	.0028 +- .0005	.0031 +- .0004
Rb	.0208 +- .0025	.0202 +- .0020	.0202 +- .0019
Sr	.0681 +- .0068	.0354 +- .0035	.0372 +- .0034
Y	.0158 +- .0032	.0129 +- .0013	.0131 +- .0012
Zr	.0000 +- .0147	.0068 +- .0043	.0064 +- .0041
Mo	.0199 +- .0100	.0241 +- .0036	.0238 +- .0034
Pd	.0000 +- .0097	.0000 +- .0024	.0000 +- .0023
Ag	.0112 +- .0116	.0059 +- .0031	.0062 +- .0030
Cd	.0038 +- .0144	.0000 +- .0045	.0002 +- .0043
In	.0000 +- .0201	.0000 +- .0053	.0000 +- .0051
Sn	.0197 +- .0223	.0000 +- .0061	.0011 +- .0059
Sb	.0000 +- .0533	.0153 +- .0132	.0144 +- .0128
Ba	.0000 +- .0886	.0000 +- .0247	.0000 +- .0239
La	.0000 +- .1749	.0524 +- .0434	.0495 +- .0421
Hg	.0045 +- .0020	.0012 +- .0005	.0014 +- .0005
Pb	.0389 +- .0061	.0215 +- .0021	.0225 +- .0021
Sum	61.7325	44.0206	45.0217

srce code	part size	revsion date	source description	reference author	reference date
5368	FCT	03/27/87	SLAG SKIM; FLASH FURNAC HYDN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .1204	.0000 +- 1.1869	.0000 +- .1561
Si	.0000 +- .3475	3.9348 +- .4663	.3704 +- .3178
P	.0000 +- .1168	.0000 +- .4568	.0000 +- .1142
S	.0000 +- 2.0188	.0000 +- 3.6242	.0000 +- 1.8603
Cl	.0000 +- .3119	.0000 +- .5609	.0000 +- .2875
K	.3983 +- .0797	.3353 +- .1442	.3924 +- .0734
Ca	.0000 +- .4418	.0000 +- 1.8173	.0000 +- .4352
Ti	.0000 +- .0094	.1032 +- .0150	.0097 +- .0087
V	.0000 +- .0038	.3061 +- .0306	.0288 +- .0045
Cr	.0000 +- .0197	.1492 +- .0223	.0140 +- .0180
Mn	.0155 +- .0017	.0153 +- .0066	.0155 +- .0016
Fe	.9613 +- .0961	6.4550 +- .6455	1.4784 +- .1062
Ni	.0000 +- .0748	.1997 +- .0746	.0188 +- .0681
Cu	.2032 +- .0203	6.3133 +- .6313	.7784 +- .0622
Zn	25.4226 +- 2.5423	11.1444 +- 2.2058	24.0785 +- 2.3123
Ga	.0000 +- .1017	.0000 +- .1894	.0000 +- .0939
As	16.4966 +- 1.6497	11.2818 +- 2.6165	16.0057 +- 1.5145
Se	.0000 +- .0980	.0000 +- .2299	.0000 +- .0914
Br	.0000 +- 1.3274	.0000 +- 2.4222	.0000 +- 1.2239
Rb	.0000 +- .0179	.0000 +- .0328	.0000 +- .0165
Sr	.0044 +- .0059	.0000 +- .0109	.0040 +- .0054
Y	.0000 +- .0824	.0000 +- .1309	.0000 +- .0757
Zr	.0000 +- .0212	.0000 +- .1342	.0000 +- .0230
Mo	.3667 +- .0367	.3911 +- .0481	.3690 +- .0335
Pd	.0000 +- .0006	.0000 +- .0036	.0000 +- .0007
Ag	.0000 +- .0043	.0000 +- .0220	.0000 +- .0044
Cd	2.1882 +- .2198	1.1467 +- .3954	2.0901 +- .2025
In	.0734 +- .0095	.0000 +- .0335	.0665 +- .0091
Sn	.6155 +- .0625	.2562 +- .1134	.5816 +- .0576
Sb	1.3926 +- .1768	1.0232 +- .3364	1.3578 +- .1633
Ba	.0000 +- .0090	.0000 +- .0541	.0000 +- .0096
La	.0000 +- .0163	.0000 +- .0998	.0000 +- .0175
Hg	.0000 +- .1171	.0000 +- .2423	.0000 +- .1085
Pb	21.1606 +- 2.1161	11.5316 +- 1.9003	20.2542 +- 1.9252
Sum	69.2988	54.5869	67.9139

srce code	part size	revsion date	source description	reference author	reference date
5369	FCT	03/27/87	MATTE & SLAG TAP;FLASH FURNACE	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .2283	.0000 +- .6908	.0000 +- .2183
Si	.0000 +- .2041	2.1882 +- .3610	.1365 +- .1927
P	.0000 +- .0880	.0000 +- .1666	.0000 +- .0831
S	.0000 +- 1.1951	.4671 +- 3.4552	.0291 +- 1.1411
Cl	.0000 +- .1848	.0000 +- .5356	.0000 +- .1765
K	.3308 +- .0331	.5825 +- .1189	.3465 +- .0319
Ca	.0000 +- .5077	.0000 +- 2.1037	.0000 +- .4938
Ti	.0000 +- .0197	.0000 +- .2218	.0000 +- .0231
V	.0000 +- .0070	.0000 +- .0455	.0000 +- .0072
Cr	.0179 +- .0020	.1228 +- .0123	.0245 +- .0021
Mn	.0129 +- .0018	.0415 +- .0087	.0146 +- .0018
Fe	2.6881 +- .2688	7.0851 +- .7085	2.9624 +- .2559
Ni	.0000 +- .0041	.0234 +- .0149	.0015 +- .0040
Cu	3.3537 +- .3354	8.4197 +- .8420	3.6697 +- .3188
Zn	9.7665 +- .9766	7.8123 +- 1.4034	9.6446 +- .9199
Ga	.0000 +- .0866	.0000 +- .2651	.0000 +- .0829
As	32.7850 +- 3.2785	31.8226 +- 5.1735	32.7250 +- 3.0909
Se	.0000 +- .0978	.0000 +- .3427	.0000 +- .0942
Br	2.5322 +- .2532	.0000 +- 5.9609	2.3743 +- .4411
Rb	.0000 +- .0320	.0000 +- .0896	.0000 +- .0306
Sr	.0000 +- .0036	.0000 +- .0142	.0000 +- .0035
Y	.0000 +- .1067	.0000 +- .2735	.0000 +- .1015
Zr	.0000 +- .0690	.0000 +- .2211	.0000 +- .0661
Mo	.1606 +- .0161	.1535 +- .0305	.1602 +- .0152
Pd	.0000 +- .0005	.0000 +- .0043	.0000 +- .0006
Ag	.0243 +- .0044	.0855 +- .0292	.0282 +- .0045
Cd	1.6787 +- .1687	1.2574 +- .4648	1.6524 +- .1608
In	.0305 +- .0056	.0000 +- .0373	.0286 +- .0058
Sn	.4233 +- .0432	.4270 +- .1363	.4235 +- .0414
Sb	1.9908 +- .2291	2.0143 +- .6583	1.9922 +- .2187
Ba	.0000 +- .0078	.0000 +- .0668	.0000 +- .0084
La	.0000 +- .0144	.0000 +- .1239	.0000 +- .0155
Hg	.0000 +- .1955	.0000 +- .5924	.0000 +- .1870
Pb	12.4640 +- 1.2464	11.5960 +- 1.7910	12.4099 +- 1.1740
Sum	68.2594	74.0988	68.6236

srce code	part size	revsion date	source description	reference author	reference date
5370	FCT	03/27/87	MATTE TAP;FLASH FURNACE HYDN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .2507	.0000 +- .7547	.0000 +- .2396
Si	.0000 +- .1447	.4989 +- .3275	.0318 +- .1370
P	.0000 +- .0518	.0000 +- .4287	.0000 +- .0557
S	.0000 +- 1.3670	.0000 +- 3.9648	.0000 +- 1.3046
Cl	.0000 +- .2114	.0000 +- .6134	.0000 +- .2017
K	.2451 +- .0245	.9096 +- .1319	.2876 +- .0245
Ca	.0000 +- .4512	.0000 +- 2.1615	.0000 +- .4444
Ti	.0000 +- .0085	.0000 +- .0353	.0000 +- .0083
V	.0000 +- .0034	.0000 +- .0139	.0000 +- .0033
Cr	.0000 +- .0121	.0281 +- .0184	.0018 +- .0114
Mn	.0000 +- .0112	.0450 +- .0169	.0029 +- .0106
Fe	.1443 +- .0144	4.4223 +- .4422	.4174 +- .0313
Ni	.0116 +- .0031	.0160 +- .0120	.0119 +- .0030
Cu	.2686 +- .0269	6.0925 +- .6093	.6404 +- .0463
Zn	10.5666 +- 1.0567	7.9760 +- 1.4590	10.4019 +- .9937
Ga	.0000 +- .1020	.0000 +- .3319	.0000 +- .0978
As	36.8618 +- 3.6862	38.0027 +- 5.8363	36.9370 +- 3.4712
Se	.0000 +- .1227	.0000 +- .4144	.0000 +- .1179
Br	.0000 +- 2.7817	.0000 +- 7.7290	.0000 +- 2.6507
Rb	.0000 +- .0352	.0000 +- .0980	.0000 +- .0336
Sr	.0000 +- .0041	.0000 +- .0193	.0000 +- .0040
Y	.0000 +- .1082	.0000 +- .2884	.0000 +- .1030
Zr	.0000 +- .0898	.0000 +- .2413	.0000 +- .0855
Mo	.1457 +- .0146	.1977 +- .0304	.1490 +- .0138
Pd	.0000 +- .0005	.0000 +- .0032	.0000 +- .0005
Ag	.0000 +- .0029	.0000 +- .0219	.0000 +- .0030
Cd	1.9531 +- .1959	1.6114 +- .5382	1.9315 +- .1866
In	.0309 +- .0049	.0851 +- .0298	.0344 +- .0050
Sn	.5255 +- .0531	.4491 +- .1520	.5207 +- .0507
Sb	2.2164 +- .2659	2.2719 +- .7286	2.2200 +- .2533
Ba	.0000 +- .0072	.0000 +- .0457	.0000 +- .0073
La	.0000 +- .0129	.0000 +- .0862	.0000 +- .0132
Hg	.0000 +- .2382	.0000 +- .6768	.0000 +- .2271
Pb	14.1499 +- 1.4150	14.5012 +- 2.0541	14.1732 +- 1.3312
Sum	67.1196	77.1075	67.7614

srce code	part size	revsion date	source description	reference author	reference date
5371	FCI	03/27/87	SLAG SKIM; FLASH FURNACE HYDN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .0936	.0000 +- 1.1776	.0000 +- .1518
Si	.0000 +- .7520	3.8552 +- .6814	.4151 +- .6750
P	.0000 +- .2402	.0000 +- .5144	.0000 +- .2214
S	.0000 +- 2.0469	.0000 +- 6.4891	.0000 +- 1.9556
Cl	.0000 +- .3167	.0000 +- .4827	.0000 +- .2873
K	.2612 +- .0261	.6427 +- .0886	.3023 +- .0252
Ca	.0000 +- .8047	.0000 +- 2.0011	.0000 +- .7497
Ti	.0447 +- .0166	.0000 +- .2301	.0399 +- .0289
V	.0153 +- .0065	.0000 +- .0470	.0136 +- .0077
Cr	.0000 +- .0138	.0000 +- .0619	.0000 +- .0140
Mn	.0000 +- .0131	.0399 +- .0127	.0043 +- .0117
Fe	.2280 +- .0228	10.0096 +- 1.0010	1.2811 +- .1097
Ni	.0000 +- .0707	.0000 +- .1549	.0000 +- .0653
Cu	.2249 +- .0225	13.2904 +- 1.3290	1.6316 +- .1445
Zn	24.7368 +- 2.4737	11.7618 +- 1.9619	23.3399 +- 2.2174
Ga	.0000 +- .1824	.0000 +- .1695	.0000 +- .1638
As	13.6084 +- 1.3608	9.2174 +- 2.1172	13.1356 +- 1.2355
Se	.0000 +- .1638	.0000 +- .2549	.0000 +- .1487
Br	.0000 +- 1.0167	.0000 +- 1.7947	.0000 +- .9276
Rb	.0000 +- .0145	.0000 +- .0252	.0000 +- .0132
Sr	.0038 +- .0060	.0000 +- .0190	.0034 +- .0058
Y	.0459 +- .0669	.0000 +- .0990	.0410 +- .0606
Zr	.0000 +- .0272	.0000 +- .1191	.0000 +- .0274
Mo	.3787 +- .0379	.3490 +- .0445	.3755 +- .0341
Pd	.0000 +- .0011	.0000 +- .0073	.0000 +- .0012
Ag	.0000 +- .0075	.0000 +- .0487	.0000 +- .0085
Cd	1.0094 +- .1041	.4534 +- .1795	.9495 +- .0949
In	.0741 +- .0137	.2683 +- .0684	.0950 +- .0142
Sn	.9134 +- .0940	.4971 +- .1713	.8686 +- .0859
Sb	2.1168 +- .2274	.8593 +- .3915	1.9814 +- .2073
Ba	.0000 +- .0173	.0000 +- .1186	.0000 +- .0200
La	.0000 +- .0322	.0000 +- .2207	.0000 +- .0373
Hg	.0000 +- .1048	.0000 +- .1560	.0000 +- .0950
Pb	21.1131 +- 2.1113	9.2076 +- 1.6064	19.8313 +- 1.8919
Sum	64.7744	60.4517	64.3090

srce code	part size	revsion date	source description	reference author	reference date
5372	FCT	03/27/87	SECONDARY CONVERTER DUCTING HD	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .0428	.0000 +- .7754	.0000 +- .0564
Si	.0000 +- .3377	.0000 +- 2.7134	.0000 +- .3487
P	.0000 +- .1270	.0000 +- .8046	.0000 +- .1272
S	.0000 +- 2.0868	.0000 +- 4.0224	.0000 +- 1.9920
Cl	.0000 +- .3220	.0000 +- 1.1934	.0000 +- .3116
K	.0984 +- .0197	.2217 +- .0551	.1047 +- .0189
Ca	.0000 +- .1446	.0000 +- .9245	.0000 +- .1450
Ti	.0000 +- .0055	.0000 +- .0322	.0000 +- .0054
V	.0000 +- .0022	.0000 +- .0127	.0000 +- .0022
Cr	.0000 +- .0066	.0000 +- .0296	.0000 +- .0065
Mn	.0000 +- .0041	.0000 +- .0264	.0000 +- .0041
Fe	.0380 +- .0041	.3299 +- .0330	.0527 +- .0043
Ni	.0000 +- .0020	.0138 +- .0084	.0007 +- .0019
Cu	.4073 +- .0407	1.9456 +- .1946	.4850 +- .0399
Zn	6.0155 +- .6015	7.2956 +- 1.1209	6.0804 +- .5740
Ga	.0000 +- .0072	.0000 +- .0868	.0000 +- .0082
As	5.5592 +- 1.2311	9.0299 +- 4.5277	5.7347 +- 1.1912
Se	.0000 +- .0878	.0000 +- .3424	.0000 +- .0851
Br	.0000 +- .4534	.0000 +- 1.7393	.0000 +- .4394
Rb	.0000 +- .0088	.0000 +- .0330	.0000 +- .0085
Sr	.0000 +- .0060	.0000 +- .0221	.0000 +- .0058
Y	.0255 +- .0688	.0686 +- .2521	.0277 +- .0666
Zr	.0096 +- .0211	.0419 +- .0783	.0112 +- .0204
Mo	.0394 +- .0039	.0783 +- .0154	.0413 +- .0038
Pd	.0000 +- .0004	.0000 +- .0032	.0000 +- .0004
Ag	.0402 +- .0048	.0085 +- .0257	.0386 +- .0048
Cd	.2416 +- .0247	.2815 +- .0968	.2437 +- .0240
In	.0360 +- .0046	.0000 +- .0301	.0342 +- .0046
Sn	.2473 +- .0252	.3749 +- .1049	.2537 +- .0245
Sb	.7716 +- .0807	1.4584 +- .3512	.8063 +- .0786
Ba	.0000 +- .0058	.0000 +- .0509	.0000 +- .0060
La	.0000 +- .0108	.0000 +- .0951	.0000 +- .0113
Hg	.0000 +- .0362	.0000 +- .1346	.0000 +- .0350
Pb	21.8162 +- 2.1816	27.4585 +- 4.0078	22.1022 +- 2.0815
Sum	35.3456	48.6069	36.0170

srce code	part size	revsion date	source description	reference author	reference date
5373	FCT	03/27/87	SECONDARY CONVERTER DUCTING HD	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .0651	.0000 +- .6687	.0000 +- .0803
Si	.0000 +- .3382	.0000 +- 3.2839	.0000 +- .4072
P	.0000 +- .1277	.0000 +- .7430	.0000 +- .1317
S	.0000 +- 2.3883	.0000 +- 6.4707	.0000 +- 2.2572
Cl	.0000 +- .3687	.0000 +- .9984	.0000 +- .3484
K	.1496 +- .0332	.4516 +- .0731	.1737 +- .0311
Ca	.0000 +- .3009	.0000 +- 1.2984	.0000 +- .2957
Ti	.0000 +- .0017	.0000 +- .0269	.0000 +- .0027
V	.0000 +- .0007	.0000 +- .0106	.0000 +- .0011
Cr	.0000 +- .0070	.0000 +- .0275	.0000 +- .0068
Mn	.0000 +- .0069	.0000 +- .0271	.0000 +- .0067
Fe	.0420 +- .0047	.2417 +- .0242	.0580 +- .0048
Ni	.0000 +- .0024	.0076 +- .0076	.0006 +- .0023
Cu	.5789 +- .0579	.9576 +- .0974	.6091 +- .0538
Zn	8.7887 +- .8789	10.1944 +- 1.1654	8.9006 +- .8139
Ga	.0487 +- .0813	.0000 +- .1622	.0448 +- .0760
As	9.0033 +- 1.4402	12.4466 +- 3.8799	9.2783 +- 1.3608
Se	.0000 +- .0901	.0000 +- .2770	.0000 +- .0858
Br	.0000 +- .7035	.0000 +- 1.9123	.0000 +- .6650
Rb	.0000 +- .0117	.0000 +- .0317	.0000 +- .0110
Sr	.0000 +- .0068	.0015 +- .0185	.0001 +- .0065
Y	.0345 +- .0785	.0782 +- .2108	.0380 +- .0741
Zr	.0188 +- .0241	.0000 +- .0911	.0173 +- .0233
Mo	.0676 +- .0068	.1120 +- .0160	.0711 +- .0063
Pd	.0000 +- .0005	.0000 +- .0027	.0000 +- .0005
Ag	.0600 +- .0070	.0537 +- .0240	.0595 +- .0067
Cd	.9912 +- .0997	1.2619 +- .2714	1.0128 +- .0942
In	.0349 +- .0051	.0956 +- .0248	.0398 +- .0051
Sn	.3574 +- .0363	.4999 +- .1061	.3688 +- .0345
Sb	1.4772 +- .1644	1.6954 +- .4206	1.4945 +- .1549
Ba	.0000 +- .0078	.0000 +- .0389	.0000 +- .0078
La	.0000 +- .0144	.0000 +- .0738	.0000 +- .0145
Hg	.0000 +- .0462	.0000 +- .1566	.0000 +- .0443
Pb	24.8734 +- 2.4873	31.7261 +- 3.3505	25.4202 +- 2.3038
Sum	46.5261	59.8236	47.5872

srce code	part size	revsion date	source description	reference author	reference date
5374	FCT	03/27/87	SECONDARY CONVERTER DUCTING HD	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .1517	.0000 +- 1.8049	.0000 +- .1806
Si	.0000 +- .7453	.0000 +- 3.9198	.0000 +- .7399
P	.0000 +- .2742	.0000 +- 1.0646	.0000 +- .2655
S	.0000 +- 2.4266	.0000 +-13.4949	.0000 +- 2.4241
Cl	.0000 +- .3745	.0000 +- 1.0811	.0000 +- .3576
K	.2009 +- .0402	.0164 +- .0692	.1895 +- .0379
Ca	.0000 +- .3318	.0000 +- 1.2403	.0000 +- .3206
Ti	.0000 +- .0093	.0000 +- .0623	.0000 +- .0095
V	.0000 +- .0036	.0000 +- .0244	.0000 +- .0037
Cr	.0000 +- .0123	.0000 +- .0337	.0000 +- .0117
Mn	.0000 +- .0082	.0000 +- .0286	.0000 +- .0079
Fe	.0353 +- .0047	.3081 +- .0309	.0521 +- .0048
Ni	.0461 +- .0046	.0000 +- .0095	.0433 +- .0044
Cu	.5736 +- .0574	1.0446 +- .1166	.6026 +- .0543
Zn	6.9320 +- .6932	5.6632 +- .9991	6.8538 +- .6534
Ga	.0352 +- .0831	.0000 +- .1597	.0330 +- .0786
As	7.6477 +- 1.4530	7.3195 +- 4.1556	7.6274 +- 1.3873
Se	.0000 +- .1582	.0000 +- .4363	.0000 +- .1509
Br	.0000 +- .5918	.0000 +- 1.7234	.0000 +- .5654
Rb	.0000 +- .0109	.0000 +- .0320	.0000 +- .0104
Sr	.0000 +- .0071	.0000 +- .0208	.0000 +- .0068
Y	.0797 +- .0806	.0000 +- .1971	.0748 +- .0766
Zr	.0146 +- .0250	.0000 +- .1194	.0137 +- .0246
Mo	.0326 +- .0051	.0725 +- .0197	.0351 +- .0049
Pd	.0000 +- .0008	.0000 +- .0058	.0000 +- .0008
Ag	.0559 +- .0080	.0186 +- .0444	.0536 +- .0080
Cd	.8743 +- .0890	.6191 +- .2575	.8586 +- .0850
In	.0402 +- .0073	.0000 +- .0569	.0377 +- .0077
Sn	.3420 +- .0359	.4177 +- .1326	.3466 +- .0347
Sb	1.1500 +- .1275	1.4340 +- .4341	1.1675 +- .1226
Ba	.0000 +- .0116	.0000 +- .0915	.0000 +- .0122
La	.0000 +- .0224	.0000 +- .1655	.0000 +- .0233
Hg	.0000 +- .0317	.0000 +- .1238	.0000 +- .0307
Pb	25.4887 +- 2.5489	22.7304 +- 3.6557	25.3188 +- 2.4024
Sum	43.5486	39.6441	43.3080

srce code	part size	revsion date	source description	reference author	reference date
5375	FCT	04/01/87	SLAG POUR #1 HAYDEN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .1319	.0000 +- .1685	.0000 +- .1188
Si	.0000 +- .8952	2.0832 +- .2083	.2303 +- .7965
P	.0000 +- .2750	.0000 +- .2755	.0000 +- .2464
S	.0000 +- 1.9615	.0000 +- 2.1428	.0000 +- 1.7606
Cl	.0000 +- .3059	.0000 +- .3322	.0000 +- .2745
K	.4245 +- .0425	.6255 +- .0863	.4467 +- .0390
Ca	.0000 +- 1.0095	.0000 +- 1.7484	.0000 +- .9185
Ti	.0000 +- .0606	.0000 +- .1147	.0000 +- .0553
V	.0000 +- .0067	.0000 +- .0135	.0000 +- .0061
Cr	.0000 +- .0121	.0000 +- .0223	.0000 +- .0110
Mn	.0000 +- .0149	.0129 +- .0032	.0014 +- .0133
Fe	.2370 +- .0237	2.0371 +- .2037	.4360 +- .0212
Ni	.0000 +- .0676	.0074 +- .0106	.0008 +- .0602
Cu	.1821 +- .0182	.5831 +- .0583	.2265 +- .0149
Zn	24.0261 +- 2.4026	24.9343 +- 2.4934	24.1265 +- 1.0956
Ga	.0000 +- .0932	.0000 +- .1157	.0000 +- .0839
As	18.3655 +- 1.8366	19.0127 +- 1.9012	18.4371 +- 1.3048
Se	.0000 +- .1355	.0000 +- .1605	.0000 +- .1218
Br	.0000 +- 1.4229	.0000 +- 1.6383	.0000 +- 1.2785
Rb	.0000 +- .0193	.0000 +- .0220	.0000 +- .0173
Sr	.0029 +- .0064	.0061 +- .0070	.0032 +- .0057
Y	.0484 +- .0648	.0000 +- .0872	.0431 +- .0584
Zr	.0000 +- .0706	.0000 +- .0598	.0000 +- .0631
Mo	.4132 +- .0413	.4208 +- .0420	.4140 +- .0241
Pd	.0000 +- .0024	.0000 +- .0029	.0000 +- .0022
Ag	.0000 +- .0146	.0347 +- .0199	.0038 +- .0132
Cd	1.7429 +- .1823	1.5882 +- .1928	1.7258 +- .1635
In	.0000 +- .0245	.0605 +- .0272	.0067 +- .0220
Sn	.9577 +- .1031	.7491 +- .0992	.9346 +- .0923
Sb	2.4680 +- .2793	1.5051 +- .2348	2.3615 +- .2497
Ba	.0000 +- .0343	.0000 +- .0509	.0000 +- .0310
La	.0000 +- .0646	.0000 +- .0880	.0000 +- .0583
Hg	.0000 +- .1312	.0000 +- .1541	.0000 +- .1179
Pb	20.3008 +- 2.0301	20.3051 +- 2.0305	20.3013 +- .9179
Sum	69.1691	73.9659	69.6995

srce code	part size	revsion date	source description	reference author	reference date
5376	FCT	04/01/87	SLAG POUR #2 HAYDEN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .2548	.2920 +- .1323	.0327 +- .2268
Si	.0000 +- 1.1488	2.4529 +- .2453	.2749 +- 1.0204
P	.0000 +- .3780	.0000 +- .3430	.0000 +- .3379
S	.5428 +- 2.9798	.0000 +- 3.2509	.4819 +- 2.6709
Cl	.0000 +- .4618	.0000 +- .5024	.0000 +- .4139
K	.2856 +- .0286	.3516 +- .0391	.2930 +- .0257
Ca	.0000 +- .7273	1.1798 +- .1511	.1322 +- .6460
Ti	.0000 +- .0429	.0000 +- .0085	.0000 +- .0381
V	.0000 +- .0083	.0000 +- .0105	.0000 +- .0074
Cr	.0000 +- .0108	.0000 +- .0028	.0000 +- .0096
Mn	.0000 +- .0142	.0113 +- .0032	.0013 +- .0126
Fe	.0665 +- .0102	1.8430 +- .1843	.2656 +- .0144
Ni	.0000 +- .0607	.0000 +- .0863	.0000 +- .0548
Cu	.0690 +- .0103	.3272 +- .0327	.0979 +- .0095
Zn	17.6966 +- 1.7697	18.4118 +- 1.8412	17.7767 +- .8084
Ga	.0000 +- .0906	.0835 +- .1165	.0094 +- .0815
As	13.2060 +- 1.8129	13.6080 +- 2.0687	13.2510 +- 1.6263
Se	.0000 +- .1164	.0000 +- .1435	.0000 +- .1046
Br	.0000 +- 1.0153	.0000 +- 1.1828	.0000 +- .9112
Rb	.0000 +- .0163	.0000 +- .0186	.0000 +- .0146
Sr	.0006 +- .0090	.0049 +- .0099	.0011 +- .0081
Y	.0751 +- .0973	.0669 +- .1104	.0742 +- .0873
Zr	.0093 +- .0322	.0000 +- .0417	.0083 +- .0290
Mo	.3142 +- .0314	.3261 +- .0326	.3155 +- .0202
Pd	.0000 +- .0019	.0000 +- .0031	.0000 +- .0017
Ag	.0000 +- .0163	.0000 +- .0173	.0000 +- .0146
Cd	1.5452 +- .1610	1.3471 +- .1651	1.5230 +- .1441
In	.0000 +- .0232	.1441 +- .0282	.0161 +- .0208
Sn	.7697 +- .0843	.7197 +- .0912	.7641 +- .0755
Sb	1.5379 +- .1837	1.5851 +- .2138	1.5432 +- .1648
Ba	.0000 +- .0328	.0000 +- .0478	.0000 +- .0297
La	.0000 +- .0624	.0000 +- .0873	.0000 +- .0563
Hg	.0000 +- .1091	.0000 +- .1266	.0000 +- .0979
Pb	30.6517 +- 3.0652	30.6679 +- 3.0668	30.6535 +- 1.3821
Sum	66.7700	73.4232	67.5155

srce code	part size	revsion date	source description	reference author	reference date
5377	F	03/05/87	ORE CRUSHER BUILDING HAYDEN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	7.6870 +- .7687		
Si	31.2080 +- 3.1208		
P	.0000 +- .2505		
S	2.4490 +- .2449		
Cl	.1445 +- .0487		
K	2.0080 +- .2008		
Ca	2.1840 +- .2184		
Ti	.9515 +- .0952		
V	.0000 +- .0155		
Cr	.0000 +- .0240		
Mn	.1379 +- .0138		
Fe	7.6867 +- .7687		
Ni	.0000 +- .0106		
Cu	1.0042 +- .1004		
Zn	.1381 +- .0154		
Ga	.0000 +- .0061		
As	.1000 +- .0215		
Se	.0000 +- .0048		
Br	.0000 +- .0042		
Rb	.0211 +- .0051		
Sr	.0213 +- .0059		
Y	.0061 +- .0067		
Zr	.0000 +- .0723		
Mo	.0391 +- .0195		
Pd	.0000 +- .0059		
Ag	.0000 +- .0338		
Cd	.0000 +- .0479		
In	.0000 +- .0506		
Sn	.0000 +- .0582		
Sb	.0000 +- .1253		
Ba	.0000 +- .1048		
La	.0000 +- .1916		
Hg	.0000 +- .0050		
Pb	.2677 +- .0268		
Sum	56.0543		

srce code	part size	revsion date	source description	reference author	reference date
5378	FCT	03/27/87	CHARGED ORE MIXTURE HAYDEN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	1.0687 +- .1146	.6469 +- .0741	.6768 +- .0692
Si	5.1475 +- .5147	3.5552 +- .3555	3.6677 +- .3320
P	.0000 +- .0585	.0000 +- .0439	.0000 +- .0409
S	14.9585 +- 1.4958	14.6559 +- 1.4656	14.6718 +- 1.3644
Cl	.0000 +- .0366	.0000 +- .0291	.0000 +- .0271
K	.3819 +- .0382	.3917 +- .0392	.3908 +- .0365
Ca	.6190 +- .0619	1.0924 +- .1092	1.0581 +- .1015
Ti	.0867 +- .0125	.0864 +- .0132	.0864 +- .0123
V	.0080 +- .0048	.0000 +- .0038	.0006 +- .0035
Cr	.0365 +- .0053	.0314 +- .0040	.0318 +- .0037
Mn	.0433 +- .0064	.0153 +- .0048	.0173 +- .0045
Fe	14.4358 +- 1.4436	17.4483 +- 1.7448	17.2259 +- 1.6226
Ni	.1171 +- .1171	.1092 +- .1092	.1097 +- .1017
Cu	22.9736 +- 2.2974	22.7908 +- 2.2791	22.7949 +- 2.1215
Zn	3.8044 +- .3804	4.6105 +- .4611	4.5510 +- .4287
Ga	.0000 +- .0073	.0000 +- .0070	.0000 +- .0065
As	.5447 +- .0545	.3102 +- .0311	.3268 +- .0291
Se	.0137 +- .0137	.0152 +- .0015	.0150 +- .0017
Br	.0425 +- .0042	.0000 +- .0018	.0030 +- .0017
Rb	.0033 +- .0022	.0082 +- .0082	.0078 +- .0076
Sr	.0066 +- .0024	.0152 +- .0152	.0146 +- .0141
Y	.0000 +- .0041	.0000 +- .0021	.0000 +- .0019
Zr	.0000 +- .0132	.0000 +- .0053	.0000 +- .0050
Mo	.1715 +- .0171	.1638 +- .0164	.1643 +- .0152
Pd	.0000 +- .0101	.0000 +- .0034	.0000 +- .0032
Ag	.0000 +- .0137	.0235 +- .0055	.0218 +- .0052
Cd	.0000 +- .0151	.0432 +- .0078	.0401 +- .0073
In	.0000 +- .0181	.0000 +- .0071	.0000 +- .0067
Sn	.0000 +- .0213	.0000 +- .0092	.0000 +- .0087
Sb	.0000 +- .0502	.0000 +- .0189	.0000 +- .0179
Ba	.0000 +- .0832	.0000 +- .0285	.0000 +- .0271
La	.0000 +- .1549	.0000 +- .0521	.0000 +- .0496
Hg	.0000 +- .0024	.0000 +- .0013	.0000 +- .0012
Pb	.7602 +- .0760	.4789 +- .0479	.4989 +- .0448
Sum	65.2235	66.4921	66.3752

srce code	part size	revsion date	source description	reference author	reference date
5379	FCT	03/27/87	COMPOSITE ROAD DUST HAYDEN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	3.1468 +- .3147	1.6822 +- .1682	1.7918 +- .1575
Si	11.8340 +- 1.1834	7.8524 +- .7852	8.1515 +- .7324
P	.0458 +- .0458	.0346 +- .0346	.0355 +- .0322
S	8.3082 +- .8308	8.9846 +- .8985	8.9376 +- .8342
Cl	.0000 +- .0576	.0000 +- .0371	.0000 +- .0346
K	.6916 +- .0692	.7150 +- .0715	.7135 +- .0664
Ca	1.8346 +- .1834	2.3294 +- .2329	2.2934 +- .2161
Ti	.1428 +- .0143	.1627 +- .0163	.1613 +- .0151
V	.0066 +- .0045	.0049 +- .0039	.0050 +- .0037
Cr	.0158 +- .0035	.0128 +- .0032	.0131 +- .0030
Mn	.0541 +- .0058	.0349 +- .0050	.0363 +- .0047
Fe	9.8841 +- .9884	12.9758 +- 1.2976	12.7506 +- 1.2038
Ni	.0769 +- .0769	.0932 +- .0932	.0921 +- .0865
Cu	14.5753 +- 1.4576	17.4639 +- 1.7464	17.2555 +- 1.6207
Zn	1.5224 +- .1523	2.0212 +- .2021	1.9848 +- .1875
Ga	.0000 +- .0114	.0000 +- .0074	.0000 +- .0069
As	.5414 +- .1738	.3950 +- .1093	.4060 +- .1021
Se	.0000 +- .0028	.0000 +- .0016	.0000 +- .0015
Br	.0412 +- .0041	.0000 +- .0023	.0031 +- .0022
Rb	.0086 +- .0027	.0116 +- .0116	.0113 +- .0107
Sr	.0065 +- .0029	.0048 +- .0016	.0049 +- .0015
Y	.0006 +- .0106	.0000 +- .0064	.0000 +- .0060
Zr	.0000 +- .0156	.0000 +- .0054	.0000 +- .0051
Mo	.1775 +- .0178	.2104 +- .0210	.2081 +- .0195
Pd	.0000 +- .0094	.0000 +- .0037	.0000 +- .0035
Ag	.0305 +- .0137	.0048 +- .0048	.0067 +- .0046
Cd	.0840 +- .0184	.0684 +- .0084	.0696 +- .0079
In	.0000 +- .0188	.0000 +- .0064	.0000 +- .0061
Sn	.0000 +- .0226	.0000 +- .0086	.0000 +- .0082
Sb	.0000 +- .0534	.0723 +- .0184	.0669 +- .0175
Ba	.0000 +- .0877	.0000 +- .0261	.0000 +- .0251
La	.0000 +- .1582	.0000 +- .0473	.0000 +- .0454
Hg	.0000 +- .0030	.0000 +- .0015	.0000 +- .0014
Pb	3.0985 +- .3098	1.9492 +- .1949	2.0355 +- .1820
Sum	56.1280	57.0840	57.0342

srce code	part size	revsion date	source description	reference author	reference date
5380	FCT	03/27/87	DUST FROM ORE CRUSHER HAYDEN	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	10.0577 +- 1.0058	6.7494 +- .6749	7.0139 +- .6327
Si	37.2626 +- 3.7263	25.7994 +- 2.5799	26.7247 +- 2.4174
P	.0382 +- .0382	.0000 +- .0244	.0028 +- .0229
S	1.0460 +- .1046	.8553 +- .0855	.8723 +- .0800
Cl	.0000 +- .0176	.0000 +- .0105	.0000 +- .0098
K	3.0585 +- .3058	3.5360 +- .3536	3.5143 +- .3300
Ca	1.4038 +- .1404	1.3038 +- .1304	1.3158 +- .1218
Ti	.6101 +- .0610	.9989 +- .0999	.9744 +- .0931
V	.0087 +- .0083	.0145 +- .0084	.0141 +- .0078
Cr	.0036 +- .0027	.0051 +- .0019	.0051 +- .0018
Mn	.0834 +- .0083	.0843 +- .0084	.0846 +- .0079
Fe	4.9695 +- .4969	5.7238 +- .5724	5.6899 +- .5342
Ni	.0110 +- .0110	.0107 +- .0107	.0108 +- .0100
Cu	.6961 +- .0696	.8243 +- .0824	.8180 +- .0769
Zn	.0322 +- .0050	.0286 +- .0045	.0290 +- .0042
Ga	.0000 +- .0013	.0000 +- .0006	.0000 +- .0005
As	.0082 +- .0034	.0019 +- .0015	.0024 +- .0014
Se	.0000 +- .0010	.0000 +- .0004	.0000 +- .0004
Br	.0000 +- .0014	.0025 +- .0025	.0023 +- .0023
Rb	.0103 +- .0021	.0192 +- .0019	.0186 +- .0018
Sr	.0170 +- .0027	.0207 +- .0021	.0205 +- .0019
Y	.0082 +- .0029	.0047 +- .0012	.0050 +- .0011
Zr	.0000 +- .0136	.0000 +- .0045	.0000 +- .0044
Mo	.0000 +- .0077	.0279 +- .0034	.0260 +- .0032
Pd	.0000 +- .0082	.0000 +- .0026	.0000 +- .0025
Ag	.0000 +- .0093	.0000 +- .0035	.0000 +- .0034
Cd	.0000 +- .0137	.0000 +- .0045	.0000 +- .0043
In	.0000 +- .0174	.0000 +- .0056	.0000 +- .0053
Sn	.0000 +- .0205	.0000 +- .0063	.0000 +- .0060
Sb	.0000 +- .0428	.0000 +- .0145	.0000 +- .0138
Ba	.0000 +- .0808	.0000 +- .0278	.0000 +- .0265
La	.0000 +- .1596	.0000 +- .0476	.0000 +- .0458
Hg	.0000 +- .0017	.0000 +- .0006	.0000 +- .0005
Pb	.0103 +- .0053	.0078 +- .0020	.0080 +- .0019
Sum	59.3354	46.0189	47.1523

srce code	part size	revsion date	source description	reference author	reference date
5381	FC	03/11/87	COMPOSITE OF 5368 & 5371 EQ.	BADGETT-WEST	03/87

SPECIES	PERCENT COMPOSITION FINE	COARSE	TOTAL
Al	.0000 +- .0924	.0000 +- .9098	
Si	.0000 +- .3229	3.9118 +- .3912	
P	.0000 +- .1066	.0000 +- .3572	
S	.0000 +- 1.5865	.0000 +- 3.1871	
Cl	.0000 +- .2452	.0000 +- .4224	
K	.3627 +- .0594	.4242 +- .1057	
Ca	.0000 +- .3881	.0000 +- 1.4154	
Ti	.0116 +- .0082	.0733 +- .0674	
V	.0040 +- .0033	.2176 +- .0257	
Cr	.0000 +- .0150	.1061 +- .0239	
Mn	.0115 +- .0036	.0224 +- .0059	
Fe	.7710 +- .0771	7.4831 +- .7483	
Ni	.0000 +- .0583	.1419 +- .0694	
Cu	.2088 +- .0209	8.3312 +- .8331	
Zn	25.2446 +- 2.5245	11.3229 +- 1.6674	
Ga	.0000 +- .0890	.0000 +- .1432	
As	15.7471 +- 1.5747	10.6848 +- 1.9580	
Se	.0000 +- .0841	.0000 +- .1792	
Br	.0000 +- 1.0178	.0000 +- 1.7982	
Rb	.0000 +- .0138	.0000 +- .0244	
Sr	.0042 +- .0046	.0000 +- .0095	
Y	.0119 +- .0634	.0000 +- .0974	
Zr	.0000 +- .0172	.0000 +- .1014	
Mo	.3698 +- .0370	.3789 +- .0379	
Pd	.0000 +- .0006	.0000 +- .0033	
Ag	.0000 +- .0037	.0000 +- .0210	
Cd	1.8823 +- .1882	.9462 +- .2858	
In	.0735 +- .0079	.0776 +- .0309	
Sn	.6928 +- .0693	.3258 +- .0946	
Sb	1.5805 +- .1581	.9758 +- .2646	
Ba	.0000 +- .0080	.0000 +- .0515	
La	.0000 +- .0147	.0000 +- .0954	
Hg	.0000 +- .0909	.0000 +- .1780	
Pb	21.1483 +- 2.1148	10.8595 +- 1.4283	
Sum	68.1247	56.2831	

srce code	part size	revsion date	source description	reference author	reference date
5382	FC	03/11/87	COMPOSITE OF 5375 & 5376 EQ.	BADGETT-WEST	03/87

SPECIES	PERCENT COMPOSITION FINE	COARSE	TOTAL
Al	.0000 +- .1489	.1559 +- .1052	
Si	.0000 +- .7409	2.2735 +- .2274	
P	.0000 +- .2387	.0000 +- .2231	
S	.2887 +- 1.8316	.0000 +- 1.9987	
Cl	.0000 +- .2843	.0000 +- .3091	
K	.3506 +- .0351	.4772 +- .0477	
Ca	.0000 +- .6107	.6297 +- .8132	
Ti	.0000 +- .0364	.0000 +- .0533	
V	.0000 +- .0054	.0000 +- .0084	
Cr	.0000 +- .0080	.0000 +- .0105	
Mn	.0000 +- .0103	.0120 +- .0022	
Fe	.1463 +- .0146	1.9266 +- .1926	
Ni	.0000 +- .0452	.0034 +- .0464	
Cu	.1220 +- .0122	.4445 +- .0445	
Zn	20.6597 +- 2.0660	21.3685 +- 2.1368	
Ga	.0000 +- .0650	.0445 +- .0820	
As	15.6213 +- 1.5621	16.0635 +- 1.6064	
Se	.0000 +- .0886	.0000 +- .1068	
Br	.0000 +- .8575	.0000 +- .9867	
Rb	.0000 +- .0125	.0000 +- .0142	
Sr	.0017 +- .0056	.0055 +- .0062	
Y	.0626 +- .0600	.0357 +- .0714	
Zr	.0050 +- .0372	.0000 +- .0355	
Mo	.3605 +- .0360	.3689 +- .0369	
Pd	.0000 +- .0015	.0000 +- .0022	
Ag	.0000 +- .0111	.0161 +- .0130	
Cd	1.6377 +- .1638	1.4541 +- .1454	
In	.0000 +- .0168	.1049 +- .0196	
Sn	.8577 +- .0858	.7309 +- .0731	
Sb	1.9733 +- .1973	1.5427 +- .1576	
Ba	.0000 +- .0237	.0000 +- .0347	
La	.0000 +- .0449	.0000 +- .0619	
Hg	.0000 +- .0845	.0000 +- .0982	
Pb	25.8061 +- 2.5806	25.7680 +- 2.5768	
Sum	67.8931	73.4262	

srce code	part size	revsion date	source description	reference author	reference date
5383	FC	03/11/87	COMPOSITE OF 5381 & 5382 EQ.	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .0807	.0304 +- .7329	
Si	.0000 +- .2962	3.5928 +- .3593	
P	.0000 +- .0973	.0000 +- .2909	
S	.0497 +- 1.3505	.0000 +- 2.5958	
Cl	.0000 +- .2087	.0000 +- .3454	
K	.3607 +- .0493	.4345 +- .0855	
Ca	.0000 +- .3380	.1226 +- 1.1507	
Ti	.0096 +- .0092	.0591 +- .0552	
V	.0033 +- .0029	.1752 +- .0207	
Cr	.0000 +- .0125	.0854 +- .0194	
Mn	.0095 +- .0035	.0204 +- .0048	
Fe	.6633 +- .0663	6.4010 +- .6401	
Ni	.0000 +- .0489	.1150 +- .0566	
Cu	.1939 +- .0194	6.7954 +- .6795	
Zn	24.4545 +- 2.4455	13.2792 +- 1.3747	
Ga	.0000 +- .0745	.0087 +- .1164	
As	15.7254 +- 1.5725	11.7322 +- 1.6005	
Se	.0000 +- .0713	.0000 +- .1458	
Br	.0000 +- .8552	.0000 +- 1.4607	
Rb	.0000 +- .0116	.0000 +- .0198	
Sr	.0038 +- .0040	.0011 +- .0077	
Y	.0207 +- .0535	.0070 +- .0797	
Zr	.0009 +- .0156	.0000 +- .0820	
Mo	.3682 +- .0368	.3769 +- .0377	
Pd	.0000 +- .0005	.0000 +- .0027	
Ag	.0000 +- .0036	.0031 +- .0171	
Cd	1.8401 +- .1840	1.0451 +- .2314	
In	.0609 +- .0071	.0829 +- .0252	
Sn	.7212 +- .0721	.4047 +- .0773	
Sb	1.6482 +- .1648	1.0862 +- .2153	
Ba	.0000 +- .0078	.0000 +- .0420	
La	.0000 +- .0144	.0000 +- .0778	
Hg	.0000 +- .0766	.0000 +- .1446	
Pb	21.9510 +- 2.1951	13.7627 +- 1.3763	
Sum	68.0848	59.6216	

srce code	part size	revsion date	source description	reference author	reference date
5384	FC	03/11/87	COMP. OF 5383, 5369, & 5370	BADGETT-WEST	03/87

SPECIES	PERCENT COMPOSITION FINE	COARSE	TOTAL
Al	.0000 +- .1162	.0146 +- .4500	
Si	.0000 +- .1307	2.3568 +- .2357	
P	.0000 +- .0462	.0000 +- .1973	
S	.0177 +- .7743	.1003 +- 1.9119	
Cl	.0000 +- .1197	.0000 +- .2789	
K	.3091 +- .0309	.6192 +- .0637	
Ca	.0000 +- .2486	.0591 +- .9846	
Ti	.0034 +- .0070	.0284 +- .0557	
V	.0012 +- .0025	.0844 +- .0146	
Cr	.0048 +- .0064	.0763 +- .0113	
Mn	.0068 +- .0045	.0328 +- .0061	
Fe	1.0055 +- .1005	5.9899 +- .5990	
Ni	.0044 +- .0175	.0654 +- .0277	
Cu	1.0621 +- .1062	6.9895 +- .6989	
Zn	15.3045 +- 1.5304	10.5717 +- 1.0572	
Ga	.0000 +- .0522	.0042 +- .1311	
As	28.2533 +- 2.8253	24.3860 +- 2.4386	
Se	.0000 +- .0589	.0000 +- .1649	
Br	.6731 +- 1.0969	.0000 +- 2.8269	
Rb	.0000 +- .0163	.0000 +- .0375	
Sr	.0013 +- .0023	.0005 +- .0077	
Y	.0074 +- .0533	.0034 +- .1144	
Zr	.0003 +- .0390	.0000 +- .0976	
Mo	.2290 +- .0229	.2765 +- .0276	
Pd	.0000 +- .0003	.0000 +- .0019	
Ag	.0065 +- .0021	.0199 +- .0124	
Cd	1.8403 +- .1840	1.2780 +- .2254	
In	.0415 +- .0041	.0666 +- .0173	
Sn	.5682 +- .0568	.4273 +- .0672	
Sb	1.9543 +- .1954	1.6672 +- .2877	
Ba	.0000 +- .0044	.0000 +- .0287	
La	.0000 +- .0080	.0000 +- .0533	
Hg	.0000 +- .1075	.0000 +- .2568	
Pb	16.4841 +- 1.6484	13.6605 +- 1.3661	
Sum	67.7787	68.7785	

srce code	part size	revsion date	source description	reference author	reference date
5385	FCT	03/27/87	COMPOSITE OF 5372-5374 EQ.	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .0391	.0000 +- .5029	.0000 +- .0487
Si	.0000 +- .2313	.0000 +- 1.9987	.0000 +- .2514
P	.0000 +- .0867	.0000 +- .4955	.0000 +- .0871
S	.0000 +- 1.3932	.0000 +- 4.0307	.0000 +- 1.3292
Cl	.0000 +- .2150	.0000 +- .6777	.0000 +- .2059
K	.1334 +- .0170	.3101 +- .0430	.1447 +- .0161
Ca	.0000 +- .1449	.0000 +- .7552	.0000 +- .1440
Ti	.0000 +- .0029	.0000 +- .0198	.0000 +- .0030
V	.0000 +- .0012	.0000 +- .0078	.0000 +- .0012
Cr	.0000 +- .0045	.0000 +- .0181	.0000 +- .0044
Mn	.0000 +- .0035	.0000 +- .0171	.0000 +- .0035
Fe	.0392 +- .0039	.2826 +- .0283	.0547 +- .0028
Ni	.0066 +- .0015	.0087 +- .0050	.0067 +- .0014
Cu	.4994 +- .0499	1.3232 +- .1323	.5520 +- .0293
Zn	7.2501 +- .7250	8.5461 +- .8546	7.3325 +- .4297
Ga	.0244 +- .0346	.0000 +- .0905	.0228 +- .0329
As	7.2286 +- .8312	10.5336 +- 2.6077	7.4395 +- .7956
Se	.0000 +- .0585	.0000 +- .1955	.0000 +- .0561
Br	.0000 +- .3589	.0000 +- 1.1746	.0000 +- .3443
Rb	.0000 +- .0063	.0000 +- .0204	.0000 +- .0061
Sr	.0000 +- .0040	.0008 +- .0126	.0000 +- .0038
Y	.0368 +- .0459	.0641 +- .1422	.0386 +- .0439
Zr	.0140 +- .0141	.0149 +- .0564	.0140 +- .0137
Mo	.0496 +- .0050	.0947 +- .0101	.0525 +- .0032
Pd	.0000 +- .0003	.0000 +- .0020	.0000 +- .0003
Ag	.0503 +- .0050	.0328 +- .0164	.0492 +- .0037
Cd	.6305 +- .0631	.8247 +- .1461	.6429 +- .0415
In	.0362 +- .0036	.0484 +- .0183	.0370 +- .0031
Sn	.3046 +- .0305	.4445 +- .0680	.3136 +- .0185
Sb	1.1065 +- .1107	1.5765 +- .2543	1.1365 +- .0742
Ba	.0000 +- .0044	.0000 +- .0296	.0000 +- .0045
La	.0000 +- .0082	.0000 +- .0554	.0000 +- .0085
Hg	.0000 +- .0252	.0000 +- .0943	.0000 +- .0243
Pb	23.5582 +- 2.3558	28.9957 +- 2.8996	23.9043 +- 1.3689
Sum	40.9685	53.1013	41.7415

srce code	part size	revsion date	source description	reference author	reference date
5386	FC	03/11/87	COMPOSITE OF 5368-5376 EQ.	BADGETT-WEST	03/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.0000 +- .0617	.0080 +- .3351	
Si	.0000 +- .1322	1.2964 +- .9044	
P	.0000 +- .0489	.0000 +- .2476	
S	.0089 +- .7931	.0552 +- 2.0939	
Cl	.0000 +- .1225	.0000 +- .3409	
K	.2219 +- .0222	.4799 +- .0480	
Ca	.0000 +- .1444	.0325 +- .6391	
Ti	.0017 +- .0038	.0156 +- .0319	
V	.0006 +- .0014	.0464 +- .0088	
Cr	.0024 +- .0039	.0420 +- .0102	
Mn	.0034 +- .0028	.0181 +- .0084	
Fe	.5261 +- .0526	3.4219 +- .3422	
Ni	.0055 +- .0089	.0399 +- .0154	
Cu	.7827 +- .0783	4.4392 +- .4439	
Zn	11.3056 +- 1.1306	9.6544 +- .9654	
Ga	.0121 +- .0314	.0023 +- .0828	
As	17.8200 +- 1.7820	18.1464 +- 1.8146	
Se	.0000 +- .0415	.0000 +- .1263	
Br	.3392 +- .5807	.0000 +- 1.6421	
Rb	.0000 +- .0088	.0000 +- .0226	
Sr	.0007 +- .0023	.0006 +- .0071	
Y	.0220 +- .0352	.0306 +- .0897	
Zr	.0071 +- .0208	.0067 +- .0594	
Mo	.1400 +- .0140	.1946 +- .0195	
Pd	.0000 +- .0002	.0000 +- .0014	
Ag	.0282 +- .0028	.0257 +- .0100	
Cd	1.2398 +- .1240	1.0735 +- .1403	
In	.0388 +- .0039	.0584 +- .0126	
Sn	.4373 +- .0437	.4347 +- .0479	
Sb	1.5333 +- .1533	1.6253 +- .1952	
Ba	.0000 +- .0031	.0000 +- .0206	
La	.0000 +- .0057	.0000 +- .0385	
Hg	.0000 +- .0556	.0000 +- .1475	
Pb	19.9831 +- 1.9983	20.5398 +- 2.0540	
Sum	54.4604	61.6882	

srce code	part size	revsion date	source description	reference author	reference date
5015	F	02/03/81	residential wood combustion	DeCesar, R.T.	02/81

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Na	.0830 +- .0120		
Mg	.0730 +- .0170		
Al	.0210 +- .0100		
S	.1820 +- .0190		
Cl	.5090 +- .0310		
K	.8600 +- .0960		
Ca	.0670 +- .0057		
Zn	.0370 +- .0021		
OC	47.5000 +-13.8000		
EC	12.8000 +- 8.4000		
SO4	.2890 +- .0210		
Sum	62.4210		

srce code	part size	revsion date	source description	reference author	reference date
5038	F	02/01/79	residual oil combustion	Watson, J.G.	02/79

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
F	.0530 +- .0190		
Na	3.5000 +- 1.7000		
Mg	.0000 +- 3.0000		
Al	.5300 +- .2400		
Si	.9600 +- .4800		
S	13.3000 +- 2.4000		
Cl	.0000 +- .1000		
K	.2800 +- .1000		
Ca	1.5800 +- .6400		
Ti	.1100 +- .0380		
V	3.4400 +- .7500		
Cr	.0470 +- .0150		
Mn	.0460 +- .0130		
Fe	2.9700 +- .6100		
Ni	5.3600 +- 1.2100		
Cu	.0750 +- .0250		
Zn	.4000 +- .1800		
Br	.0130 +- .0210		
Pb	.1100 +- .0640		
OC	7.0000 +- 6.2000		
EC	3.1000 +- 2.5000		
SO4	48.1000 +-11.9000		
NO3	.6500 +- .4400		
Sum	91.6240		

srce code	part size	revsion date	source description	reference author	reference date
5092	T	03/17/87	SHALE, CRUSTAL 65th CRC	Pettijohn, J.	00/48

SPECIES	PERCENT COMPOSITION FINE	COARSE	TOTAL
C			1.5180 +- .3036
Na			.9646 +- .1929
Mg			1.4713 +- .2943
Al			8.1466 +- 1.6293
Si			27.1327 +- 5.4265
P			.0741 +- .0148
S			.2560 +- .0512
K			2.6892 +- .5378
Ca			2.2236 +- .4447
Ti			.3894 +- .0779
Fe			4.7136 +- .9427
Ba			.0448 +- .0090
Sum			49.6239

srce code	part size	revsion date	source description	reference author	reference date
5093	I	03/17/87	LIMESTONE, CRUSTAL 65th CRC	Pettijohn, F.	00/48

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
C			11.3404 +- 2.2681
Na			.0371 +- .0074
Mg			4.7577 +- .9515
Al			.4285 +- .0857
Si			2.4237 +- .4847
P			.0174 +- .0035
S			.0200 +- .0040
K			.2739 +- .0548
Ca			30.4375 +- 6.0875
Ti			.0359 +- .0072
Fe			.3775 +- .0755
Sum			50.1496

srce code	part size	revsion date	source description	reference author	reference date
5095	I	12/01/81	ammonium sulfate	Houck, J.E.	12/81

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
S			24.0000 +- 1.0000
SO4			73.0000 +- 3.6000
Sum			97.0000

srce code	part size	revsion date	source description	reference author	reference date
5116	T	09/26/83	lime handling (CaO)	Cooper, J.A.	09/83

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Ca			71.0000 +- 7.1000
Sum			71.0000

srce code	part size	revsion date	source description	reference author	reference date
5117	I	09/26/83	gypsum handling ($CaSO_4.2H_2O$)	Cooper, J.A.	09/83

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
S			18.6000 +- 1.8600
Ca			23.3000 +- 2.3300
SO4			55.8000 +- 5.5800
Sum			97.7000

srce code	part size	revsion date	source description	reference author	reference date
5127	F	09/26/83	secondary organic carbon	Cooper, J.A.	09/83

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
OC	83.0000 +- 8.3000		
Sum	83.0000		

APPENDIX D

AVERAGE SOURCE CONTRIBUTION TABLES

APPENDIX D

AVERAGE SOURCE CONTRIBUTION TABLES*

Average Result Category	Regime	Site	Size	Table No.
Study Average Mass	S	1	F	C1
		1	C	C2
		2	F	C3
		2	C	C4
Study Average Lead	S	1	F	C5
		1	C	C6
		2	F	C7
		2	C	C8
Study Average Arsenic	S	1	F	C9
		1	C	C10
		2	F	C11
		2	C	C12
Study Average Cadmium	S	1	F	C13
		2	F	C14
				C16
Regime Stratified Average Mass	1	2	F	C17
			C	C18
	2	1	F	C19
		1	C	C20
		2	F	C21
		2	C	C22
	3	1	F	C23
		1	C	C24
		2	F	C25
		2	C	C26

*Averages based on QSAS III source calculations.

Table C1

HAYDEN JAIL FINE AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 12
AVERAGE CHI-SQUARED : 3.85

SOURCE CONTRIBUTIONS TO MASS

	SOURCE	MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	3.93+-	.48	1.68	.57	28.19+-	2.71	12
5117	GYPSUM	.38+-	.21	.74	.06	2.84+-	1.45	4
5345	TRANS	.19+-	.14	.47	.08	1.57+-	1.13	2
5365	KNECTT	1.42+-	.59	2.04	.24	8.30+-	3.47	8
5368	SSFF1	.10+-	.07	.24	.03	.61+-	.41	2
5369	MTFF1	.03+-	.03	.09	.02	.14+-	.14	1
5370	MTFF2	.02+-	.02	.05	.00	.15+-	.15	1
5371	SSFF2	.02+-	.02	.07	.00	.18+-	.18	1
5372	2NDCD1	.02+-	.02	.06	.00	.19+-	.19	1
5373	2NDCD2	.12+-	.07	.25	.01	1.01+-	.66	3
5374	2NDCD3	.29+-	.12	.42	.06	1.64+-	.64	5
5376	SLPR#2	.03+-	.03	.09	.00	.44+-	.44	1
5378	CHORMX	.12+-	.08	.29	.04	1.13+-	.76	2
5380	ORDUST	5.55+-	1.82	6.31	.44	32.26+-	5.72	11
5385	CONCOM	.03+-	.03	.09	.01	.24+-	.24	1
	UNEXPL	2.37+-	.52	1.80		21.11+-	4.19	
	SUM	14.59				100.00		
	AVE. MASS	14.59 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C2

HAYDEN JAIL COARSE AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 12
AVERAGE CHI-SQUARED : 2.14

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	.10+-	.10	.35	.02	.69+-	.69	1
5116	CaO	.57+-	.57	1.97	.17	1.00+-	1.00	1
5117	GYPSUM	2.56+-	.50	1.75	.61	5.84+-	.93	11
5365	KNECTT	19.29+-	4.10	14.20	3.43	42.68+-	6.38	12
5368	SSFF1	.03+-	.02	.07	.01	.08+-	.06	2
5370	MTFF2	.00+-	.00	.01	.00	.01+-	.01	1
5371	SSFF2	.13+-	.06	.21	.02	.28+-	.11	5
5374	2NDCD3	.03+-	.02	.06	.01	.07+-	.05	2
5375	SLPR#1	.00+-	.00	.01	.00	.00+-	.00	1
5378	CHORMX	.09+-	.09	.33	.03	.21+-	.21	1
5380	ORDUST	22.17+-	5.69	19.70	2.62	48.13+-	6.40	12
5385	CONCOM	.01+-	.01	.03	.00	.06+-	.05	2
	UNEXPL	-.08+-	1.14	3.95		.95+-	2.76	
	SUM	44.90				100.00		
	AVE. MASS	44.90 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C3

GARFIELD FINE AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 13
AVERAGE CHI-SQUARED : 3.63

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	4.11+-	.43	1.55	.57	29.40+-	2.54	13
5117	GYPSUM	.09+-	.04	.14	.02	.71+-	.30	5
5345	TRANS	.23+-	.12	.44	.09	1.57+-	.89	3
5365	KNECTT	.70+-	.24	.87	.18	4.22+-	1.26	7
5368	SSFF1	.01+-	.01	.04	.01	.05+-	.04	2
5369	MTFF1	.06+-	.05	.19	.01	.57+-	.47	2
5371	SSFF2	.02+-	.02	.06	.00	.16+-	.16	1
5372	2NDCD1	.07+-	.07	.26	.01	1.06+-	1.06	1
5373	2NDCD2	.25+-	.14	.50	.03	1.66+-	.92	3
5374	2NDCD3	.12+-	.06	.23	.03	.70+-	.31	4
5376	SLPR#2	.05+-	.05	.20	.01	.60+-	.60	1
5378	CHORMX	.09+-	.09	.34	.04	.46+-	.46	1
5379	PLNTRD	.06+-	.06	.22	.04	.60+-	.60	1
5380	ORDUST	6.50+-	1.70	6.14	.50	38.01+-	4.66	13
5385	CONCOM	.13+-	.09	.33	.01	.86+-	.63	2
	UNEXPL	2.47+-	.62	2.25		19.38+-	3.97	
	SUM	14.96				100.00		
	AVE. MASS	14.96 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C4

GARFIELD COARSE AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 13
AVERAGE CHI-SQUARED : 2.86

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5116	CaO	.34+-	.30	1.07	.09	.18+-	.14	2
5117	GYPSUM	1.54+-	.44	1.58	.38	3.16+-	1.05	8
5363	CANDRD	.14+-	.14	.51	.04	.25+-	.25	1
5365	KNECTT	3.25+-	1.67	6.02	.94	3.56+-	1.61	4
5366	CU ORT	5.29+-	3.60	12.97	1.09	5.02+-	3.47	2
5368	SSFF1	.05+-	.04	.13	.01	.05+-	.03	2
5371	SSFF2	.11+-	.05	.20	.03	.23+-	.14	4
5374	2NDCD3	.03+-	.02	.06	.01	.08+-	.05	2
5376	SLPR#2	.01+-	.01	.03	.00	.01+-	.01	2
5378	CHORMX	.02+-	.02	.06	.01	.03+-	.03	1
5379	PLNTRD	.54+-	.35	1.25	.14	.46+-	.27	3
5380	ORDUST	67.25+-	13.03	46.98	5.42	76.77+-	5.80	13
5385	CONCOM	.00+-	.00	.01	.00	.01+-	.01	1
	UNEXPL	10.97+-	4.41	15.92		10.18+-	3.95	
	SUM	89.55				100.00		
	AVE. MASS	89.55 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C5

HAYDEN JAIL FINE PB AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 12
AVERAGE CHI-SQUARED : 3.85

SOURCE CONTRIBUTIONS TO Pb

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5345	TRANS	.0046+-	.0032	.0110	.0023	4.54+-	3.18	2
5365	KNECTT	.0005+-	.0002	.0007	.0001	.53+-	.28	8
5368	SSFF1	.0210+-	.0144	.0499	.0065	6.43+-	4.45	2
5369	MTFF1	.0033+-	.0033	.0114	.0020	.68+-	.68	1
5370	MTFF2	.0022+-	.0022	.0077	.0007	1.44+-	1.44	1
5371	SSFF2	.0044+-	.0044	.0153	.0009	4.47+-	4.47	1
5372	2NDCD1	.0051+-	.0051	.0175	.0010	10.15+-	10.15	1
5373	2NDCD2	.0297+-	.0179	.0620	.0045	24.09+-	12.64	3
5374	2NDCD3	.0730+-	.0310	.1074	.0178	31.15+-	11.63	5
5376	SLPR#2	.0084+-	.0084	.0290	.0012	6.52+-	6.52	1
5378	CHORMX	.0009+-	.0006	.0022	.0003	.88+-	.59	2
5380	ORDUST	.0006+-	.0002	.0007	.0003	.56+-	.32	11
5385	CONCOM	.0062+-	.0062	.0215	.0019	4.00+-	4.00	1
	UNEXPL	.0076+-	.0059	.0204		4.57+-	4.43	
	SUM	.1674				100.00		
	AVE. MASS	.1674 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C6

HAYDEN JAIL COARSE PB AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 12
AVERAGE CHI-SQUARED : 2.14

SOURCE CONTRIBUTIONS TO Pb

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5365	KNECTT	.0048+-	.0010	.0035	.0010	14.35+-	3.19	12
5368	SSFF1	.0031+-	.0024	.0082	.0008	11.05+-	7.45	2
5370	MTFF2	.0003+-	.0003	.0010	.0002	.98+-	.98	1
5371	SSFF2	.0116+-	.0056	.0195	.0027	30.67+-	11.03	5
5374	2NDCD3	.0061+-	.0042	.0144	.0016	13.71+-	9.37	2
5375	SLPR#1	.0006+-	.0006	.0022	.0002	3.06+-	3.06	1
5378	CHORMX	.0005+-	.0005	.0016	.0001	.96+-	.96	1
5380	ORDUST	.0017+-	.0004	.0015	.0005	6.60+-	1.91	12
5385	CONCOM	.0033+-	.0023	.0081	.0009	11.56+-	7.98	2
	UNEXPL	.0021+-	.0011	.0040		7.07+-	3.13	
	SUM	.0342				100.00		
	AVE. MASS	.0342 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C7

GARFIELD FINE PB AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 13
AVERAGE CHI-SQUARED : 3.63

SOURCE CONTRIBUTIONS TO Pb

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5345	TRANS	.0053+-	.0029	.0103	.0025	8.33+-	4.84	3
5365	KNECTT	.0002+-	.0001	.0003	.0001	.25+-	.17	7
5368	SSFF1	.0029+-	.0021	.0076	.0015	3.16+-	2.39	2
5369	MTFF1	.0079+-	.0065	.0235	.0017	5.59+-	4.46	2
5371	SSFF2	.0034+-	.0034	.0123	.0005	5.35+-	5.35	1
5372	2NDCD1	.0157+-	.0157	.0566	.0023	8.69+-	8.69	1
5373	2NDCD2	.0614+-	.0342	.1233	.0094	23.98+-	12.64	3
5374	2NDCD3	.0304+-	.0165	.0594	.0084	18.44+-	8.54	4
5376	SLPR#2	.0166+-	.0166	.0599	.0023	7.22+-	7.22	1
5378	CHORMX	.0007+-	.0007	.0026	.0003	.21+-	.21	1
5379	PLNTRD	.0019+-	.0019	.0068	.0013	.78+-	.78	1
5380	ORDUST	.0007+-	.0002	.0006	.0003	.65+-	.34	13
5385	CONCOM	.0301+-	.0216	.0778	.0042	16.11+-	11.03	2
	UNEXPL	-.0033+-	.0064	.0230		1.24+-	3.67	
	SUM	.1739				100.00		
	AVE. MASS	.1739 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C8

GARFIELD COARSE PB AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 13
AVERAGE CHI-SQUARED : 2.86

SOURCE CONTRIBUTIONS TO Pb

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5363	CANDRD	.0015+-	.0015	.0053	.0004	4.52+-	4.52	1
5365	KNECTT	.0008+-	.0004	.0015	.0002	3.68+-	2.75	4
5366	CU ORT	.0010+-	.0007	.0024	.0002	3.77+-	2.66	2
5368	SSFF1	.0057+-	.0041	.0148	.0014	11.80+-	8.23	2
5371	SSFF2	.0101+-	.0050	.0180	.0030	20.09+-	9.69	4
5374	2NDCD3	.0059+-	.0041	.0147	.0017	13.50+-	9.26	2
5376	SLPR#2	.0033+-	.0023	.0082	.0007	11.42+-	7.74	2
5378	CHORMX	.0001+-	.0001	.0003	.0001	.29+-	.29	1
5379	PLNTRD	.0106+-	.0068	.0244	.0029	13.81+-	8.28	3
5380	ORDUST	.0052+-	.0010	.0037	.0014	14.90+-	4.65	13
5385	CONCOM	.0008+-	.0008	.0030	.0005	2.60+-	2.60	1
	UNEXPL	.0004+-	.0015	.0053		-.39+-	3.60	
	SUM	.0453				100.00		
	AVE. MASS	.0453 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C9

HAYDEN JAIL FINE AS AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 12
AVERAGE CHI-SQUARED : 3.85

SOURCE CONTRIBUTIONS TO As

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5365	KNECTT	.0000+-	.0000	.0000	.0001	.02+-	.01	8
5368	SSFF1	.0164+-	.0112	.0389	.0050	9.30+-	6.65	2
5369	MTFF1	.0087+-	.0087	.0301	.0054	2.86+-	2.86	1
5370	MTFF2	.0058+-	.0058	.0202	.0019	4.41+-	4.41	1
5371	SSFF2	.0028+-	.0028	.0099	.0006	10.48+-	10.48	1
5372	2NDCD1	.0017+-	.0017	.0058	.0009	4.76+-	4.76	1
5373	2NDCD2	.0108+-	.0065	.0224	.0021	26.46+-	15.82	3
5374	2NDCD3	.0219+-	.0093	.0322	.0065	31.07+-	13.45	5
5376	SLPR#2	.0036+-	.0036	.0125	.0006	12.96+-	12.96	1
5378	CHORMX	.0007+-	.0005	.0016	.0002	1.75+-	1.27	2
5380	ORDUST	.0005+-	.0001	.0005	.0002	1.97+-	1.50	11
5385	CONCOM	.0019+-	.0019	.0066	.0006	1.44+-	1.44	1
	UNEXPL	.0052+-	.0051	.0177		-7.48+-	11.92	
	SUM	.0799				100.00		
	AVE. MASS	.0799 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C10

HAYDEN JAIL COARSE AS AVERAGE FILTERS WITH AS VALUES ABOVE DET. LIMITS
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 11
AVERAGE CHI-SQUARED : 2.11

SOURCE CONTRIBUTIONS TO As

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5365	KNECTT	.0003+-	.0001	.0002	.0003	2.06+-	.72	11
5368	SSFF1	.0033+-	.0025	.0083	.0010	19.08+-	12.80	2
5370	MTFF2	.0008+-	.0008	.0028	.0006	4.64+-	4.64	1
5371	SSFF2	.0127+-	.0061	.0201	.0035	69.72+-	25.39	5
5374	2NDCD3	.0022+-	.0015	.0048	.0013	19.26+-	13.68	2
5375	SLPR#1	.0007+-	.0007	.0022	.0002	11.17+-	11.17	1
5378	CHORMX	.0003+-	.0003	.0011	.0001	2.20+-	2.20	1
5380	ORDUST	.0004+-	.0001	.0004	.0004	4.06+-	1.59	11
5385	CONCOM	.0008+-	.0008	.0028	.0003	4.57+-	4.57	1
	UNEXPL	-.0053+-	.0018	.0059		-36.77+-	10.97	
	SUM	.0163				100.00		
	AVE. MASS	.0163 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C11

GARFIELD FINE AS AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 13
AVERAGE CHI-SQUARED : 3.63

SOURCE CONTRIBUTIONS TO As

	SOURCE	MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5365	KNECTT	.0000+-	.0000	.0000	.0000	.01+-	.00	7
5368	SSFF1	.0023+-	.0016	.0059	.0012	8.57+-	6.94	2
5369	MTFF1	.0208+-	.0172	.0619	.0045	8.15+-	5.55	2
5371	SSFF2	.0022+-	.0022	.0079	.0004	10.49+-	10.49	1
5372	2NDCD1	.0040+-	.0040	.0144	.0010	13.51+-	13.51	1
5373	2NDCD2	.0222+-	.0124	.0446	.0044	18.52+-	9.86	3
5374	2NDCD3	.0091+-	.0049	.0178	.0029	15.13+-	9.11	4
5376	SLPR#2	.0072+-	.0072	.0258	.0012	7.32+-	7.32	1
5378	CHORMX	.0005+-	.0005	.0019	.0002	.26+-	.26	1
5379	PLNTRD	.0003+-	.0003	.0012	.0003	.30+-	.30	1
5380	ORDUST	.0005+-	.0001	.0005	.0002	1.78+-	1.06	13
5385	CONCOM	.0092+-	.0066	.0239	.0014	18.56+-	13.53	2
	UNEXPL	.0185+-	.0118	.0427		-2.61+-	10.05	
	SUM	.0968				100.00		
	AVE. MASS	.0968 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C12

GARFIELD COARSE AS AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 13
AVERAGE CHI-SQUARED : 2.86

SOURCE CONTRIBUTIONS TO As

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5363	CANDRD	.0002+-	.0002	.0007	.0001	2.35+-	2.35	1
5365	KNECTT	.0000+-	.0000	.0001	.0001	.46+-	.35	4
5368	SSFF1	.0056+-	.0040	.0145	.0016	14.51+-	10.78	2
5371	SSFF2	.0101+-	.0050	.0180	.0034	43.93+-	22.62	4
5374	2NDCD3	.0019+-	.0013	.0047	.0012	13.45+-	9.13	2
5376	SLPR#2	.0015+-	.0010	.0036	.0004	17.66+-	11.96	2
5378	CHORMX	.0000+-	.0000	.0002	.0000	.63+-	.63	1
5379	PLNTRD	.0021+-	.0014	.0050	.0008	8.98+-	5.31	3
5380	ORDUST	.0013+-	.0002	.0009	.0010	9.10+-	2.64	13
5385	CONCOM	.0003+-	.0003	.0011	.0002	3.59+-	3.59	1
	UNEXPL	-.0009+-	.0039	.0142		-14.68+-	15.54	
	SUM	.0222				100.00		
	AVE. MASS	.0222 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C13

HAYDEN JAIL FINE CD AVERAGE FILTERS WITH CD VALUES ABOVE DET. LIMITS
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 6
AVERAGE CHI-SQUARED : 2.53

SOURCE CONTRIBUTIONS TO Cd

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5345	TRANS	.0000+-	.0000	.0001	.0000	.96+-	.96	1
5365	KNECTT	.0000+-	.0000	.0000	.0001	.21+-	.12	3
5368	SSFF1	.0043+-	.0028	.0069	.0013	30.56+-	20.62	2
5369	MTFF1	.0009+-	.0009	.0022	.0005	6.96+-	6.96	1
5371	SSFF2	.0004+-	.0004	.0010	.0001	9.89+-	9.89	1
5373	2NDCD2	.0008+-	.0008	.0019	.0001	19.96+-	19.96	1
5374	2NDCD3	.0039+-	.0019	.0047	.0010	29.87+-	15.62	3
5376	SLPR#2	.0008+-	.0008	.0021	.0001	5.48+-	5.48	1
	UNEXPL	-.0004+-	.0038	.0094		-3.90+-	29.72	
	SUM	.0109				100.00		
	AVE. MASS	.0109 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C14

GARFIELD FINE CD AVERAGE FILTERS WITH CD VALUES ABOVE DET. LIMITS
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 5
AVERAGE CHI-SQUARED : 4.24

SOURCE CONTRIBUTIONS TO Cd

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5345	TRANS	.0000+-	.0000	.0001	.0000	.29+-	.29	1
5365	KNECTT	.0000+-	.0000	.0000	.0001	.17+-	.10	3
5369	MTFF1	.0023+-	.0023	.0051	.0004	21.79+-	21.79	1
5372	2NDCD1	.0005+-	.0005	.0010	.0001	2.80+-	2.80	1
5373	2NDCD2	.0030+-	.0030	.0066	.0005	22.04+-	22.04	1
5374	2NDCD3	.0008+-	.0005	.0012	.0003	6.95+-	4.26	2
5385	CONCOM	.0007+-	.0007	.0016	.0001	5.60+-	5.60	1
	UNEXPL	.0060+-	.0034	.0076		40.36+-	24.28	
	SUM	.0133				100.00		
	AVE. MASS	.0133 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C17

Regime 1

HIGH WIND SPEED FROM EAST, SITE 2 FINE AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 3
AVERAGE CHI-SQUARED : 5.20

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	3.17+-	.93	1.62	.43	26.87+-	5.84	3
5117	GYPSUM	.13+-	.13	.22	.03	.88+-	.88	1
5365	KNECTT	.11+-	.11	.19	.03	1.61+-	1.61	1
5372	2NDCD1	.31+-	.31	.54	.03	4.61+-	4.61	1
5373	2NDCD2	.24+-	.24	.42	.02	1.52+-	1.52	1
5380	ORDUST	3.85+-	.98	1.70	.27	30.84+-	2.20	3
5385	CONCOM	.37+-	.37	.63	.04	2.56+-	2.56	1
	UNEXPL	4.11+-	1.96	3.40		31.11+-	9.79	
	SUM	12.28				100.00		
	AVE. MASS	12.28 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C18

Regime 1

HIGH WIND SPEED FROM EAST, SITE 2 COARSE AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 3
AVERAGE CHI-SQUARED : 4.17

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5116	CaO	1.49+-	1.19	2.06	.39	.80+-	.51	2
5366	CU ORT	22.94+-	11.57	20.04	4.71	21.77+-	11.46	2
5371	SSFF2	.07+-	.07	.12	.01	.07+-	.07	1
5376	SLPR#2	.03+-	.03	.04	.00	.02+-	.02	1
5379	PLNTRD	.92+-	.92	1.60	.16	.42+-	.42	1
5380	ORDUST	83.42+-	46.30	80.19	8.25	49.17+-	15.37	3
	UNEXPL	36.70+-	3.15	5.45		27.74+-	4.97	
	SUM	145.57				100.00		
	AVE. MASS	145.57 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C19

Regime 2

LOW WIND SPEED FROM SOUTH, SITE 1 FINE AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 5
AVERAGE CHI-SQUARED : 4.07

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	4.53+-	.41	.92	.65	36.27+-	2.42	5
5117	GYPSUM	.55+-	.44	.98	.09	3.17+-	2.35	2
5345	TRANS	.29+-	.29	.65	.10	2.53+-	2.53	1
5365	KNECTT	.21+-	.09	.20	.06	1.93+-	.83	3
5368	SSFF1	.14+-	.14	.31	.05	.75+-	.75	1
5369	MTFF1	.06+-	.06	.14	.04	.34+-	.34	1
5370	MTFF2	.04+-	.04	.08	.01	.35+-	.35	1
5371	SSFF2	.05+-	.05	.11	.01	.44+-	.44	1
5372	2NDCD1	.04+-	.04	.10	.01	.46+-	.46	1
5374	2NDCD3	.33+-	.23	.51	.08	1.95+-	1.27	2
5378	CHORMX	.14+-	.14	.32	.05	1.25+-	1.25	1
5380	ORDUST	2.71+-	.49	1.10	.21	20.88+-	1.60	5
5385	CONCOM	.06+-	.06	.14	.02	.58+-	.58	1
	UNEXPL	3.58+-	.46	1.04		29.11+-	4.42	
	SUM	12.74				100.00		
	AVE. MASS	12.74 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C20

Regime 2

LOW WIND SPEED FROM SOUTH, SITE 1 COARSE AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 5
AVERAGE CHI-SQUARED : 1.67

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	.24+-	.24	.54	.04	1.65+-	1.65	1
5117	GYPSUM	1.86+-	.92	2.05	.40	5.32+-	1.52	4
5365	KNECTT	18.29+-	7.91	17.69	2.62	55.61+-	9.49	5
5368	SSFF1	.02+-	.02	.04	.00	.13+-	.13	1
5370	MTFF2	.00+-	.00	.01	.00	.03+-	.03	1
5371	SSFF2	.16+-	.13	.28	.02	.37+-	.23	2
5374	2NDCD3	.04+-	.04	.08	.01	.11+-	.11	1
5380	ORDUST	8.30+-	.90	2.01	1.58	38.02+-	8.86	5
5385	CONCOM	.02+-	.02	.04	.00	.12+-	.12	1
	UNEXPL	-.48+-	.92	2.05		-1.36+-	3.35	
	SUM	28.45				100.00		
	AVE. MASS	28.45 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C21

Regime 2

LOW WIND SPEED FROM SOUTH, SITE 2 FINE AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 4
AVERAGE CHI-SQUARED : 3.72

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	4.81+-	.73	1.47	.66	34.93+-	1.05	4
5117	GYPSUM	.13+-	.07	.14	.04	1.14+-	.61	3
5345	TRANS	.49+-	.30	.59	.21	4.21+-	2.44	2
5365	KNECTT	.47+-	.47	.94	.10	2.29+-	2.29	1
5369	MTFF1	.04+-	.04	.07	.01	.31+-	.31	1
5371	SSFF2	.05+-	.05	.10	.01	.53+-	.53	1
5373	2NDCD2	.37+-	.37	.75	.04	1.82+-	1.82	1
5374	2NDCD3	.14+-	.08	.16	.03	1.08+-	.62	2
5378	CHORMX	.31+-	.31	.62	.12	1.49+-	1.49	1
5380	ORDUST	4.34+-	1.03	2.07	.33	30.88+-	5.57	4
	UNEXPL	2.72+-	.44	.88		21.30+-	5.10	
	SUM	13.88				100.00		
	AVE. MASS	13.88 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C22

Regime 3

LOW WIND SPEED FROM SOUTH, SITE 2 COARSE AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 4
AVERAGE CHI-SQUARED : 2.22

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5117	GYPSUM	2.16+-	.70	1.40	.55	4.70+-	.90	4
5365	KNECTT	2.81+-	1.99	3.98	1.19	5.36+-	3.31	2
5371	SSFF2	.15+-	.15	.31	.02	.25+-	.25	1
5374	2NDCD3	.08+-	.05	.10	.02	.26+-	.15	2
5376	SLPR#2	.02+-	.02	.03	.00	.03+-	.03	1
5378	CHORMX	.05+-	.05	.10	.03	.10+-	.10	1
5379	PLNTRD	.11+-	.11	.21	.07	.36+-	.36	1
5380	ORDUST	38.41+-	4.41	8.82	2.77	88.00+-	4.95	4
	UNEXPL	1.10+-	2.31	4.61		.94+-	5.02	
	SUM	44.89				100.00		
	AVE. MASS	44.89 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C23

Regime 3

MODERATE WINDS FROM SOUTH EAST, SITE 1 FINE AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 5
AVERAGE CHI-SQUARED : 2.16

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	3.92+-	1.01	2.25	.60	21.41+-	3.62	5
5117	GYPSUM	.30+-	.30	.67	.05	2.80+-	2.80	1
5365	KNECTT	1.98+-	.81	1.82	.44	9.53+-	2.69	4
5368	SSFF1	.10+-	.10	.22	.02	.73+-	.73	1
5373	2NDCD2	.29+-	.15	.33	.03	2.42+-	1.43	3
5374	2NDCD3	.30+-	.20	.45	.06	1.54+-	.96	2
5378	CHORMX	.16+-	.16	.35	.05	1.46+-	1.46	1
5380	ORDUST	10.30+-	3.41	7.63	.81	51.70+-	5.62	5
	UNEXPL	.85+-	.71	1.60		8.42+-	4.78	
	SUM	18.18				100.00		
	AVE. MASS	18.18 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C24

Regime 3

MODERATE WIND FROM SOUTH EAST, SITE 1 COARSE AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 5
AVERAGE CHI-SQUARED : 2.33

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5117	GYPSUM	2.96+-	.70	1.56	.81	5.59+-	1.72	5
5365	KNECTT	22.00+-	5.16	11.54	4.14	35.58+-	7.40	5
5368	SSFF1	.05+-	.05	.11	.01	.06+-	.06	1
5371	SSFF2	.12+-	.09	.19	.02	.25+-	.16	2
5374	2NDCD3	.03+-	.03	.06	.01	.06+-	.06	1
5375	SLPR#1	.01+-	.01	.02	.00	.01+-	.01	1
5378	CHORMX	.23+-	.23	.51	.06	.49+-	.49	1
5380	ORDUST	39.31+-	9.10	20.35	3.79	61.16+-	8.10	5
	UNEXPL	-2.33+-	1.43	3.20		-3.20+-	2.18	
	SUM	62.37				100.00		
	AVE. MASS	62.37 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C25

Regime 3

MODERATE WIND FROM SOUTH EAST, SITE 2 FINE AVERAGE
FINE PARTICLE FRACTION
NUMBER OF SAMPLES : 4
AVERAGE CHI-SQUARED : 1.51

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5095	NH3SO4	3.90+-	.97	1.93	.57	22.81+-	3.51	4
5345	TRANS	.25+-	.25	.49	.07	.89+-	.89	1
5365	KNECTT	1.54+-	.39	.78	.42	9.02+-	1.40	4
5368	SSFF1	.04+-	.03	.06	.02	.16+-	.10	2
5373	2NDCD2	.25+-	.25	.49	.03	2.44+-	2.44	1
5374	2NDCD3	.20+-	.20	.40	.04	.72+-	.72	1
5376	SLPR#2	.18+-	.18	.35	.02	1.94+-	1.94	1
5379	PLNTRD	.20+-	.20	.39	.14	1.95+-	1.95	1
5380	ORDUST	11.81+-	4.68	9.35	.92	55.12+-	9.59	4
	UNEXPL	.37+-	.57	1.15		4.96+-	4.03	
	SUM	18.73				100.00		
	AVE. MASS	18.73 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

Table C26

Regime 3

MODERATE WIND FROM SOUTH EAST, SITE 2 COARSE AVERAGE
COARSE PARTICLE FRACTION
NUMBER OF SAMPLES : 4
AVERAGE CHI-SQUARED : 3.18

SOURCE CONTRIBUTIONS TO MASS

SOURCE		MEAN	*A	*B	*C	MEAN	*A	#>MDC
		(UG/M3)				(PERCENT)		
5117	GYPSUM	1.85+-	1.10	2.21	.37	4.22+-	3.11	2
5365	KNECTT	7.76+-	4.59	9.18	1.87	6.22+-	3.74	2
5368	SSFF1	.06+-	.06	.11	.01	.04+-	.04	1
5371	SSFF2	.15+-	.09	.18	.05	.46+-	.40	2
5379	PLNTRD	.96+-	.96	1.93	.26	.81+-	.81	1
5380	ORDUST	86.37+-	23.06	46.11	5.92	86.00+-	2.58	4
	UNEXPL	1.17+-	3.07	6.15		2.24+-	2.90	
	SUM	98.31				100.00		
	AVE. MASS	98.31 UG/M3						

*A - STANDARD DEVIATION OF THE MEAN (STANDARD ERROR)
*B - STANDARD DEVIATION OF THE DISTRIBUTION
*C - AVERAGE SOURCE CONTRIBUTION UNCERTAINTY

APPENDIX E

HAYDEN POINT AND AREA SOURCE EMISSIONS INVENTORY RESULTS AND DOCUMENTATION

HAYDEN POINT SOURCE INVENTORY TOTALS

Source Description	PM10 Emissions (tons/year)
ASARCO Smelter Stack	87.6 ok
ASARCO Smelter Building Fugitives	17.7* ok
ASARCO Slag Dump	40 ok
Copper Ore Storage	15.7
Copper Ore Crushing and Conveying	~~69~~ 88
Lime Handling	13
Gypsum Handling	13
Total Point Source PM10 Emission	256

4 69 15.7 84.7

*Changed from ~~272~~ 172 as a result of comparison with receptor and dispersion model results.

HAYDEN AREA SOURCE EMISSIONS INVENTORY TOTALS

SUMMARY REPORT - ACTIVITY LEVELS AND EMISSIONS

File directories: B: (Activity values)
G: (Emission factors)

DATE: 01/04/80 TIME: 7:02

Emissions in ~~tons~~ lbs per year

	Activity	Cell	Records	Total	Units	TSP	PM10	PM2.5	PM1	
103	ARTERIALS - EX B T	TOTAL	19	11,124,000	1000 VMT	3,771.1	3,431.9	2,608.6	2,080.0	0.0
105	LOCAL STREETS - EX B T	TOTAL	33	1,108,000	1000 VMT	419.1	381.0	285.7	226.5	0.0
113	ARTERIALS - FUG DUST	TOTAL	18	9,344,000	1000 VMT	46,720.0	18,220.8	7,942.4	0.0	0.0
115	LOCAL STREETS - FUG DUST	TOTAL	33	1,108,000	1000 VMT	5,540.0	2,160.6	941.8	0.0	0.0
120	UNPAVED ROADS - FUG DUST	TOTAL	22	53,500	1000 VMT	108,284.0	48,738.5	12,866.9	0.0	0.0
121	CANYON RD - UNPAVED	TOTAL	3	7,800	1000 VMT	15,787.2	7,105.8	1,875.9	0.0	0.0
122	KENNECOTT RD - UNPAVED	TOTAL	3	16,000	1000 VMT	32,384.0	14,576.0	3,848.0	0.0	0.0
125	OFF ROAD VEHICLES	TOTAL	9	72,000	1000 VMT	10,512.0	4,680.0	1,224.0	0.0	0.0
160	CLEARED AREAS - WB DUST	TOTAL	15	218,000	ACRES	82,513.0	4,578.0	43.6	0.0	0.0
184	TAILINGS PILES - WB DUST	TOTAL	12	1,760,000	ACRES	********.*	169,840.0	1,584.0	0.0	0.0
221	WOOD BURNING STOVES	TOTAL	6	39,200	TONS	823.2	586.0	392.0	98.0	0.0
275	LOCOMOTIVES -.EXHAUST	TOTAL	7	965,200	1000 GALLONS	12,065.0	10,858.4	9,748.4	8,928.0	0.0
		* TOTAL	180			********.*	285,159.0	43,361.3	11,332.5	0.0

HAYDEN PLANNING AREA EMISSIONS INVENTORY

INTRODUCTION

This report contains the Hayden point and area source emissions inventory documentation. The area and point source totals are listed in the two preceding tables. The first section of this report shows the point source documentation and the second the area source documentatiom. The area source data were organized in the ASES microcomputer emissions inventory data management system. Attached at the back of the report are the emissions inventory totals by activity and grid square, a grid map and a printout of area source emission factors.

POINT SOURCE EMISSIONS INVENTORY DOCUMENTATION

20 lbs/hr

ASARCO Smelter Stack

The emission rate of 20 lbs per hour particlulate was obtained from the emissions inventory data submitted to the Arizona Department of Health Services by ASARCO. Because emission were predominantly metal fume it was assumed all particulate could be included as PM10.

ASARCO Smelter Building Fugitives

Emission factors from AP-42 Sec.7.3.3 for copper smelter fugitive emissions (TSP) are as follows:

Flash Furnace (Smelting Furnace)	= 0.4 lb/ton concentrate
Converter	= 4.4 lb/ton concentrate
Anode Furnace	= 0.5 lb/ton concentrate

Assume 90% control of flash furnace and converter fugitives, no control of the anode furnace, and 60% of total particulate as PM10.

$$0.1(0.4) + 0.1(4.4) + 0.5)0.7 = 0.69 \text{ lbsPM10/T Conc}$$

At approximately 500,000 tons concentrate processed annually, estimated emissions are 172 tons/year. The receptor modeling/dispersion modeling indicated severe overestimation of this number.

ASARCO Slag Dump

AP-42 contains no emission factor for the dumping of copper furnace slag. Conversation with ASARCO indicated that one 20 ton dump occured approximately every hour. This value could not be used as no factor applied. AP-42 contained a factor for lead slag cooling of 0.47 lbs/ton of product. With this factor and the annual production rate of

167,000 tons copper ASARCO's data submitted to ADHS, an emission rate of 40 tons per year was calculated. All emissions were estimated to be in the PM10 range.

Copper Ore Storage

The ADHS supplied source test information indicating emissions of 0.6 lbs/hour per 15,000 cfm for the Rotoclones on the crusher and ore conveyor system. Two 15000 cfm Rotoclones on the storage area were thus estimated yo emit 1.2 lbs/hour. Assuming the Rotoclones are 95 percent efficient and that the hooding captures 80% of the emission, the hourly emission rate, assuming 50% as PM10, becomes 3.6 lbs/hour, or 15.7 Tons/year.

Copper Ore Crushing and Conveying

Approximately 6 Rotoclone collectors control dust from this equipment. Using the same size Rotoclones and the same capture and efficiency as above, the PM10 emissions calculate to 47 lbs/hour. Adding 25% to cover sources not hooded and vented to collectors the total calculates to ~~69~~ 58.8 Tons/year. miscalc.

Lime Handling

According to ASARCO no lime kilns were operated in 1986 or 1987. ASARCO purchases lime, which is stored on the former Kennecott property and trucked to the concentrator area as needed. An average of 3 lbs/hour was estimated for these combined source locations, calculating to 13 ton per year PM10.

Gypsum Handling

A loading hopper above the rail siding just south of Winkleman was the only identified source of Gypsum. The loading area has no dust control equipment. This emission was equated to the lime handling, estimated at 13 tons/yr PM10.

DOCUMENTATION OF AREA SOURCE EMISSIONS INVENTORY

Arterials - Exhaust, Brake, and Tire Wear (Activity Code 103)

Activity Levels

The average daily traffic(ADT) data were obtained from the Arizona Department of Transportation(ADOT) "Traffic on the Arizona Highway System, 1984". Only Highways 77 and 177 were considered in the "arterial" category. All other streets were designated "local".

Local Paved Streets, Brake, Exhaust, and Tire Wear (Activity Code 105)

Activity Levels

No traffic counts were available for these streets. Estimates were derived from the differences in ADOT's traffic counts on the roads on either side of Hayden and Winkleman, and from traffic observations.

Emission Factors for Exhaust, Brake and Tire Wear for all Street Types (103, 105) Emissions were calculated using the following equations obtained from EPA Rg.IX, citing EPA 460/3-85-007 (Energy and Environmental Associates, Inc.) and ~~MOBILE3~~ (See Maricopa/Pima report for additional emission factor information concerning these categories):

TSP = PM10/0.9 (not given, est. from PM10)
PM10 = traffic speed(exp -0.19)
PM2.5 = traffic speed(exp -0.17)
PM1 = traffic speed(exp -0.16)

Traffic speed estimates were as follows:

Arterials	35 mph
Local Streets	25 mph

These calculated to the following emission factors:

Arterials	TSP	= 0.678 lbs/1000VMT
	PM10	= 0.617 lbs/1000VMT
	PM2.5	= 0.469 lbs/1000VMT
	PM1	= 0.374 lbs/1000VMT
Local Streets	TSP	= 0.756 lbs/1000VMT
	PM10	= 0.687 lbs/1000VMT
	PM2.5	= 0.516 lbs/1000VMT
	PM1	= 0.409 lbs/1000VMT

Reliability of Estimates

Estimates were given a "C" rating.

Arterials - Fugitive Dust (Activity Code 113)

Activity Levels

From ADOT,1984, the same as Activity Code 103

Local Paved Streets - Fugitive Dust (Activity Code 114)

Activity Levels

Same as Activity Code 104

Emission Factors for Fugitive Dust from all Paved Road Types (Activity Code 113, and 114)

The factors used were derived from the EPA AP-42 Section 11.2.-5 equations using results of silt loading measurements in the Tucson area conducted by Engineering Science in July, 1986. ("PM10 Emissions Inventory Data for the Maricopa and Pima Planning Areas", EPA Contract 68-02-3888m Work Assignment 35, January, 1987). These silt loading averages were similar to those measured by EPA for average U. S. cities. The following shows the equation:

$$E = k \left(\frac{SL}{0.7}\right)^{p} \quad \text{(lbs/VMT)}$$

where
E = particulate emission factor (lbs/VMT)
L = total road surface dust loading (grains/ft2)
S = surface silt content, fraction of particles < 75 um diameter. (American Association of State Highway Officials)
K = base emission factor (lbs/VMT)
p = exponent (dimensionless)
(Combined SL = silt loading in grains/ft2)

For TSP	K = 0.0208,	p = 0.9
PM10	K = 0.0081,	p = 0.8
PM2.5	K = 0.0036,	p = 0.6

For arterials and local streets the measured silt loadings from the Pima Planning Area test sites were calculated into emission factors and the factors averaged to apply to all areas. This average factor was used for both arterial and local streets. Section 2 of the Maricopa/Pima report lists the silt loadings from which the factors were calculated. The average silt loading was 0.327 — SL grains/square foot. The average silt loading value used in the equation calculates to approximately the same result as averaging individual emission factors. Following are the emission factors:

Arterials and Local Streets	TSP	= 10	lbs/1000VMT
	PM10	= 3.9	lbs/1000VMT
	PM2.5	= 1.7	lbs/1000VMT

Reliability of Estimates

These estimates were given a "C" to "D" rating.

Unpaved Roads, Streets, Alleys, Parking Lots - Fugitive Dust (Activity Code 120)

Activity Levels

The VMTs for these categories were derived from observations and judgements for traffic on unpaved rural and small community roads.

Emissions Factors

The unpaved road silt sample taken at Kennecott Road showed a 12.5% silt content. This compares with EPA's default value for estimating unpaved road silt content of 12%. Following is the unpaved road equation from AP-42 Section 11.2.1, with estimates for each parameter:

$$E = K(5.9)\left(\frac{s}{12}\right)\left(\frac{S}{30}\right)\left(\frac{W}{3}\right)^{0.7}\left(\frac{w}{4}\right)^{0.5}\left(\frac{365-p}{365}\right) = \text{lbs/VMT}$$

K = particle size multiplies = 0.8 for TSP
= 0.36 for PM10
= 0.095 for PM2.5

s = silt content = 12.5
S = average speed = 25 mph
W = vehicle weight = 2.5 tons
w = number of wheels = 6
p = number of days exceeding 0.1" precipitation = 30

Emission factors useing these values calculated as follows:

TSP = 4048 lbs/1000VMT
PM10 = 1822 lbs/1000VMT
PM2.5 = 481 lbs/1000VMT

Reliability of Estimates

Additional samples collected and analyzed would have improved estimate reliability. The estimates used were judged a "D".

Off-Road Vehicles (Activity Code 125)

Activity Levels

These activity levels were estimated from observations and from conversations with Hayden residents.

Emission Factor

The unpaved road emission factor equation from AP-42 Section 11.2.1 was used for these estimates. (Category 120 lists the equation) The silt content was increased to 15% to reflect the generally higher silt content of lesser used unpaved areas. The following numbers were used to calculate the factor:

Speed = 30
Weight = 0.2 tons
Wheels = 3
p = 30 days
Silt = 15%

Resultant emission factors were as follows:

TSP = 378 lbs/1000VMT
PM10 = 170 lbs/1000VMT
PM2.5 = 45 lbs/1000VMT

Reliability of Estimates
These estimates were rated a "D".

Cleared Areas - Wind Blown Dust (Activity Code 160)

Activity Levels
Observations and comparisons with other studies (PEI Associates,1985, for EPA) and (TRW Inc.,1982, for EPA) were the basis for the areas judged to be susceptible to wind erosion.

Emission Factor
Figure 1 shows the wind speed frequencies for Hayden developed from the ASARCO monitoring station located in the town of Hayden. Note that the wind speeds are in knots/hr. Table 1 lists the wind speed frequencies in miles/hour and meters/sec and also shows the calculations for development of cleared area emission factors.

The flux equations shown were developed by Nickling and Gillies from wind tunnel test data at construction sites (Nickling, W.G. , and Gillies, J.A., "Evaluation of Aerosal Production Potential of Type Surfaces in Arizona", MND Associates, July 1986). Test results from the Tuscon construction site were selected to characterize the Hayden cleared areas. The test particle size results were particle counts rather than aerodynamic mass, and required conversion to mass through assumptions and calulations. The PM10 EI for Maricopa/Pima report describes this procedure. Following are the emission factors developed:

TSP	= 0.75(578)	= 753	lb/acre/yr
PM10	= 0.055(434)	= 41	lb/acre/yr
PM2.5	= 0.0005(434)	= 4	lb/acre/yr

Reliability of Estimates
These estimates were given a "D" rating.

Tailings Piles - Windblown Dust (Activity Code 184)

Activity Level
The areas of the tailings copper tailings piles were scaled from USGS maps of the Hayden area and applied to the emssions inventory grid squares.

Emissions Factors
Wind tunnel tests conducted in June, 1986 (see Nuckling and Gillies, or the Maricopa/ Pima report - Section 2) provided threshold wind speed and flux equation data for the Hayden tailings piles. Figure 1 lists wind speed frequency data for the Hayden area measured at the downtown Hayden

station. These wind speeds may be somewhat lower than experienced at the tailings piles, the latter of which are in the middle of a valley and less protected. Table 2 shows the flux values in each of the two applicable wind speed categories and a sample calculation for emissions of total particulate. Mass paricle size distributions were calculated from particle count data of windborne samples collected in the wind tunnel windstream. Section 2 of the Maricopa/Pima report illustrate this methodology. Following are the calculated size specific emission factors.

TSP	=	3513	lbs/acre/yr
PM10	=	193	lbs/acre/yr
PM2.5	=	1.8	lbs/acre/yr

Reliability of Estimates

The wind tunnel tests provided source specific emissions threshold and emissions data. Possible weaknesses in the factors are the wind data from a more sheltered area and the uncertainties associated with converting particle counts to particle mass distributions. These factors rate a "C" to "D".

Wood Burning Stoves (Activity Code 221)

Activity Level

Conversation with local residents indicated that wood was not used significantly as a fuel in the Hayden area. An EPA publication, "Guide for Compiling a Comprehensive Emissions Inventory" EPA, AOQPS, March 1973, indicated that using wood as a fuel a residence would burn 0.0017 tons per degree day. Phoenix degree days,(Marks Mechanical Engineering Handbook, 1967) were 1698. Assuming approximately 250 dwellings in The Hayden area and only about 3% of heat provided by wood, the total wood burned calculated to 21 tons per year.

Emission Factor

AP-42 Section 1.9.1 lists TSP emission factors for wood stoves at 42 lbs/Ton. EPA's "Compilation of a Preliminary Particle-Sized Emissions Factor Data Base", EPA-450/4-82-016, Nov 1982, lists size distributions for wood fired boiler emissions. From this information the following factors were calculated:

TSP	42 lbs/T
PM10	30 lbs/T
PM2.5	20 lbs/T
PM1	5 lbs/T

Reliability of Estimates f

The assumptions necessary to develop these estimates does not justify a factor better then "E".

Locomotives - Exhaust (Activity Code 275)

Activity Level

Observations of locomotive use indicated at least one locomotive was idling at any given time. It was estimated that an average 1000 horsepower was constantly expended through the year. At 30% efficiency and an estimate 150,000 BTUs per gallon of fuel, the locomotives burned an average of 55 gallons per hour..

Emission Factor

The locomotive emission factors were taken from AP-42, with size specific ratios from Heavy Duty Diesels:

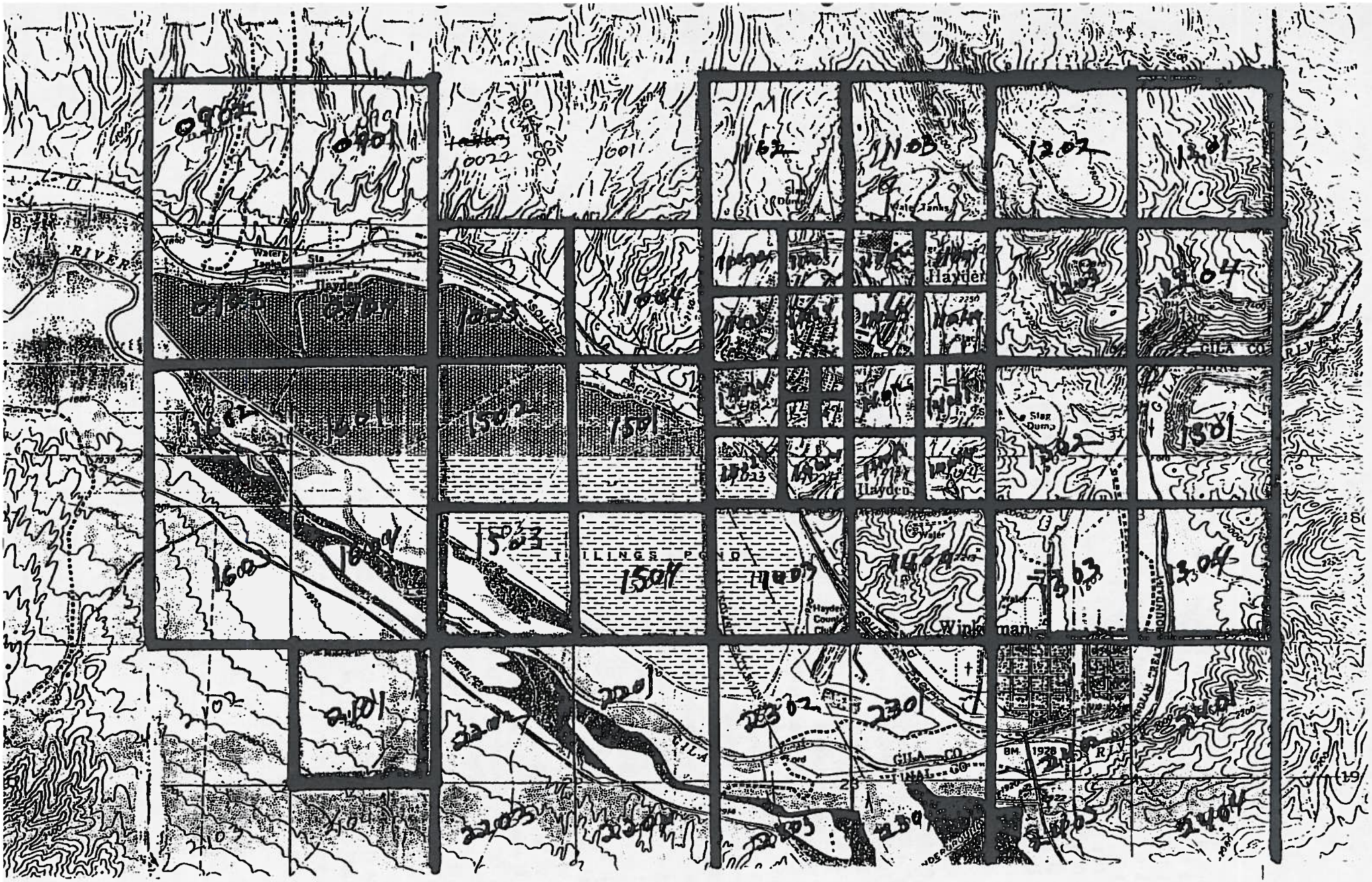
TSP	25.0 lbs/1000 gallons fuel
PM10	22.5 lbs/1000 gallons fuel
PM2.5	20.2 lbs/1000 gallons fuel
PM1	18.5 lbs/1000 gallons fuel

Reliability of Estimates

These estimates were given a "C" to "D" rating.

EMISSION FACTOR FILE

Code	Activity description	Cell	Pollutant		Factor	Adjust
103	ARTERIALS - EX B T	0-00-00-0	11101	TSP	0.678	1.00
103	ARTERIALS - EX B T	0-00-00-0	11102	PM10	0.617	1.00
103	ARTERIALS - EX B T	0-00-00-0	11103	PM2.5	0.469	1.00
103	ARTERIALS - EX B T	0-00-00-0	11104	PM1	0.374	1.00
105	LOCAL STREETS - EX B T	0-00-00-0	11101	TSP	0.756	1.00
105	LOCAL STREETS - EX B T	0-00-00-0	11102	PM10	0.687	1.00
105	LOCAL STREETS - EX B T	0-00-00-0	11103	PM2.5	0.516	1.00
105	LOCAL STREETS - EX B T	0-00-00-0	11104	PM1	0.409	1.00
113	ARTERIALS - FUG DUST	0-00-00-0	11101	TSP	10.000	1.00
113	ARTERIALS - FUG DUST	0-00-00-0	11102	PM10	3.900	1.00
113	ARTERIALS - FUG DUST	0-00-00-0	11103	PM2.5	1.700	1.00
115	LOCAL STREETS - FUG DUST	0-00-00-0	11101	TSP	10.000	1.00
115	LOCAL STREETS - FUG DUST	0-00-00-0	11102	PM10	3.900	1.00
115	LOCAL STREETS - FUG DUST	0-00-00-0	11103	PM2.5	1.700	1.00
120	UNPAVED ROADS - FUG DUST	0-00-00-0	11101	TSP	4,048.000	1.00
120	UNPAVED ROADS - FUG DUST	0-00-00-0	11102	PM10	1,822.000	1.00
120	UNPAVED ROADS - FUG DUST	0-00-00-0	11103	PM2.5	481.000	1.00
121	CANYON RD - UNPAVED	0-00-00-0	11101	TSP	4,048.000	1.00
121	CANYON RD - UNPAVED	0-00-00-0	11102	PM10	1,822.000	1.00
121	CANYON RD - UNPAVED	0-00-00-0	11103	PM2.5	481.000	1.00
122	KENNECOTT RD - UNPAVED	0-00-00-0	11101	TSP	4,048.000	1.00
122	KENNECOTT RD - UNPAVED	0-00-00-0	11102	PM10	1,822.000	1.00
122	KENNECOTT RD - UNPAVED	0-00-00-0	11103	PM2.5	481.000	1.00
125	OFF ROAD VEHICLES	0-00-00-0	11101	TSP	292.000	1.00
125	OFF ROAD VEHICLES	0-00-00-0	11102	PM10	130.000	1.00
125	OFF ROAD VEHICLES	0-00-00-0	11103	PM2.5	34.000	1.00
160	CLEARED AREAS - WB DUST	0-00-00-0	11101	TSP	757.000	1.00
160	CLEARED AREAS - WB DUST	0-00-00-0	11102	PM10	42.000	1.00
160	CLEARED AREAS - WB DUST	0-00-00-0	11103	PM2.5	0.400	1.00
184	TAILINGS PILES - WB DUST	0-00-00-0	11101	TSP	3,513.000	1.00
184	TAILINGS PILES - WB DUST	0-00-00-0	11102	PM10	193.000	1.00
184	TAILINGS PILES - WB DUST	0-00-00-0	11103	PM2.5	1.800	1.00
221	WOOD BURNING STOVES	0-00-00-0	11101	TSP	42.000	1.00
221	WOOD BURNING STOVES	0-00-00-0	11102	PM10	30.000	1.00
221	WOOD BURNING STOVES	0-00-00-0	11103	PM2.5	20.000	1.00
221	WOOD BURNING STOVES	0-00-00-0	11104	PM1	5.000	1.00
275	LOCOMOTIVES - EXHAUST	0-00-00-0	11101	TSP	25.000	1.00
275	LOCOMOTIVES - EXHAUST	0-00-00-0	11102	PM10	22.500	1.00
275	LOCOMOTIVES - EXHAUST	0-00-00-0	11103	PM2.5	20.200	1.00
275	LOCOMOTIVES - EXHAUST	0-00-00-0	11104	PM1	18.500	1.00



RIVER
Water Tanks
Hayden
Slag Dump
Water Tanks
Hayden
GILA CO
RIVER
Slag Dump
Hayden
TAILINGS POND
Hayden Country Club
Winkelman
GILA CO
PINAL CO
BM 1928

SUMMARY REPORT - ACTIVITY LEVELS AND EMISSIONS

File directories: B: (Activity values)
B: (Emission factors)

DATE: 01/04/80 TIME: 7:54

Emissions in lbs. per year

Cell	Activity	Records	Total Units Divide by 2000		PM10				
0-09-02-0	103 ARTERIALS - EX B T		220,000	1000 VMT	67.9	0.0	0.0	0.0	0.0
0-09-02-0	113 ARTERIALS - FUG DUST		220,000	1000 VMT	429.0	0.0	0.0	0.0	0.0
0-09-02-0	TOTAL	2			496.9	0.0	0.0	0.0	0.0
0-09-03-0	103 ARTERIALS - EX B T		584,000	1000 VMT	180.2	0.0	0.0	0.0	0.0
0-09-03-0	113 ARTERIALS - FUG DUST		584,000	1000 VMT	1,138.8	0.0	0.0	0.0	0.0
0-09-03-0	184 TAILINGS PILES - WB DUST		186,000	ACRES	17,949.0	0.0	0.0	0.0	0.0
0-09-03-0	TOTAL	3			19,268.0	0.0	0.0	0.0	0.0
0-09-04-0	103 ARTERIALS - EX B T		730,000	1000 VMT	225.2	0.0	0.0	0.0	0.0
0-09-04-0	113 ARTERIALS - FUG DUST		730,000	1000 VMT	1,423.5	0.0	0.0	0.0	0.0
0-09-04-0	184 TAILINGS PILES - WB DUST		186,000	ACRES	17,949.0	0.0	0.0	0.0	0.0
0-09-04-0	TOTAL	3			19,597.7	0.0	0.0	0.0	0.0
0-10-03-0	103 ARTERIALS - EX B T		730,000	1000 VMT	225.2	0.0	0.0	0.0	0.0
0-10-03-0	113 ARTERIALS - FUG DUST		730,000	1000 VMT	1,423.5	0.0	0.0	0.0	0.0
0-10-03-0	184 TAILINGS PILES - WB DUST		96,000	ACRES	9,264.0	0.0	0.0	0.0	0.0
0-10-03-0	275 LOCOMOTIVES - EXHAUST		76,200	1000 GALLONS	857.2	0.0	0.0	0.0	0.0
0-10-03-0	TOTAL	4			11,769.9	0.0	0.0	0.0	0.0
0-11-01-0	103 ARTERIALS - EX B T		350,000	1000 VMT	108.0	0.0	0.0	0.0	0.0
0-11-01-0	105 LOCAL STREETS - EX B T		20,000	1000 VMT	6.9	0.0	0.0	0.0	0.0
0-11-01-0	113 ARTERIALS - FUG DUST		350,000	1000 VMT	682.5	0.0	0.0	0.0	0.0
0-11-01-0	115 LOCAL STREETS - FUG DUST		20,000	1000 VMT	39.0	0.0	0.0	0.0	0.0
0-11-01-0	TOTAL	4			836.4	0.0	0.0	0.0	0.0
0-11-02-0	105 LOCAL STREETS - EX B T		4,000	1000 VMT	1.4	0.0	0.0	0.0	0.0
0-11-02-0	115 LOCAL STREETS - FUG DUST		4,000	1000 VMT	7.8	0.0	0.0	0.0	0.0
0-11-02-0	TOTAL	2			9.2	0.0	0.0	0.0	0.0
0-11-03-1	103 ARTERIALS - EX B T		22,000	1000 VMT	6.8	0.0	0.0	0.0	0.0
0-11-03-1	105 LOCAL STREETS - EX B T		90,000	1000 VMT	30.9	0.0	0.0	0.0	0.0
0-11-03-1	113 ARTERIALS - FUG DUST		22,000	1000 VMT	42.9	0.0	0.0	0.0	0.0
0-11-03-1	115 LOCAL STREETS - FUG DUST		90,000	1000 VMT	175.5	0.0	0.0	0.0	0.0
0-11-03-1	120 UNPAVED ROADS - FUG DUST		1,000	1000 VMT	911.0	0.0	0.0	0.0	0.0
0-11-03-1	121 CANYON RD - UNPAVED		3,000	1000 VMT	2,733.0	0.0	0.0	0.0	0.0
0-11-03-1	122 KENNECOTT RD - UNPAVED		3,000	1000 VMT	2,733.0	0.0	0.0	0.0	0.0
0-11-03-1	125 OFF ROAD VEHICLES		4,000	1000 VMT	260.0	0.0	0.0	0.0	0.0
0-11-03-1	TOTAL	8			6,893.1	0.0	0.0	0.0	0.0
0-11-03-2	105 LOCAL STREETS - EX B T		6,000	1000 VMT	2.1	0.0	0.0	0.0	0.0
0-11-03-2	115 LOCAL STREETS - FUG DUST		6,000	1000 VMT	11.7	0.0	0.0	0.0	0.0
0-11-03-2	120 UNPAVED ROADS - FUG DUST		500	1000 VMT	455.5	0.0	0.0	0.0	0.0
0-11-03-2	125 OFF ROAD VEHICLES		4,000	1000 VMT	260.0	0.0	0.0	0.0	0.0
0-11-03-2	160 CLEARED AREAS - WB DUST		4,000	ACRES	84.0	0.0	0.0	0.0	0.0
0-11-03-2	221 WOOD BURNING STOVES		200	TONS	3.0	0.0	0.0	0.0	0.0
0-11-03-2	TOTAL	6			816.3	0.0	0.0	0.0	0.0

SUMMARY REPORT - ACTIVITY LEVELS AND EMISSIONS

File directories: B: (Activity values)
B: (Emission factors)

DATE: 01/04/80 TIME: 7:54

Emissions in lbs. per year

Cell	Activity	Records	Total	Units (Divide by 2000)	PM10				
0-11-03-3	105 LOCAL STREETS - EX B T ✓		70,000	1000 VMT	24.0	0.0	0.0	0.0	0.0
0-11-03-3	115 LOCAL STREETS - FUG DUST		70,000	1000 VMT	136.5	0.0	0.0	0.0	0.0
0-11-03-3	120 UNPAVED ROADS - FUG DUST		3,500	1000 VMT	3,188.5	0.0	0.0	0.0	0.0
0-11-03-3	121 CANYON RD - UNPAVED		800	1000 VMT	728.8	0.0	0.0	0.0	0.0
0-11-03-3	125 OFF ROAD VEHICLES		4,000	1000 VMT	260.0	0.0	0.0	0.0	0.0
0-11-03-3	160 CLEARED AREAS - WB DUST		12,000	ACRES	252.0	0.0	0.0	0.0	0.0
0-11-03-3	221 WOOD BURNING STOVES		6,000	TONS	90.0	0.0	0.0	0.0	0.0
0-11-03-3	TOTAL	7			4,679.8	0.0	0.0	0.0	0.0
0-11-03-4	105 LOCAL STREETS - EX B T ✓		80,000	1000 VMT	27.5	0.0	0.0	0.0	0.0
0-11-03-4	115 LOCAL STREETS - FUG DUST		80,000	1000 VMT	156.0	0.0	0.0	0.0	0.0
0-11-03-4	120 UNPAVED ROADS - FUG DUST		2,000	1000 VMT	1,822.0	0.0	0.0	0.0	0.0
0-11-03-4	121 CANYON RD - UNPAVED		4,000	1000 VMT	3,644.0	0.0	0.0	0.0	0.0
0-11-03-4	122 KENNECOTT RD - UNPAVED		6,000	1000 VMT	5,466.0	0.0	0.0	0.0	0.0
0-11-03-4	125 OFF ROAD VEHICLES		20,000	1000 VMT	1,300.0	0.0	0.0	0.0	0.0
0-11-03-4	160 CLEARED AREAS - WB DUST		12,000	ACRES	252.0	0.0	0.0	0.0	0.0
0-11-03-4	221 WOOD BURNING STOVES		5,000	TONS	75.0	0.0	0.0	0.0	0.0
0-11-03-4	TOTAL	8			12,742.5	0.0	0.0	0.0	0.0
0-11-04-1	120 UNPAVED ROADS - FUG DUST		500	1000 VMT	455.5	0.0	0.0	0.0	0.0
0-11-04-1	160 CLEARED AREAS - WB DUST		4,000	ACRES	84.0	0.0	0.0	0.0	0.0
0-11-04-1	TOTAL	2			539.5	0.0	0.0	0.0	0.0
0-11-04-2	105 LOCAL STREETS - EX B T ✓		40,000	1000 VMT	13.7	0.0	0.0	0.0	0.0
0-11-04-2	115 LOCAL STREETS - FUG DUST		40,000	1000 VMT	78.0	0.0	0.0	0.0	0.0
0-11-04-2	120 UNPAVED ROADS - FUG DUST		4,000	1000 VMT	3,644.0	0.0	0.0	0.0	0.0
0-11-04-2	160 CLEARED AREAS - WB DUST		20,000	ACRES	420.0	0.0	0.0	0.0	0.0
0-11-04-2	TOTAL	4			4,155.7	0.0	0.0	0.0	0.0
0-11-04-3	105 LOCAL STREETS - EX B T ✓		20,000	1000 VMT	6.9	0.0	0.0	0.0	0.0
0-11-04-3	115 LOCAL STREETS - FUG DUST		20,000	1000 VMT	39.0	0.0	0.0	0.0	0.0
0-11-04-3	120 UNPAVED ROADS - FUG DUST		3,000	1000 VMT	2,733.0	0.0	0.0	0.0	0.0
0-11-04-3	160 CLEARED AREAS - WB DUST		50,000	ACRES	1,050.0	0.0	0.0	0.0	0.0
0-11-04-3	TOTAL	4			3,828.9	0.0	0.0	0.0	0.0
0-11-04-4	105 LOCAL STREETS - EX B T ✓		20,000	1000 VMT	6.9	0.0	0.0	0.0	0.0
0-11-04-4	115 LOCAL STREETS - FUG DUST		20,000	1000 VMT	39.0	0.0	0.0	0.0	0.0
0-11-04-4	120 UNPAVED ROADS - FUG DUST		3,000	1000 VMT	2,733.0	0.0	0.0	0.0	0.0
0-11-04-4	160 CLEARED AREAS - WB DUST		20,000	ACRES	420.0	0.0	0.0	0.0	0.0
0-11-04-4	TOTAL	4			3,198.9	0.0	0.0	0.0	0.0
0-12-01-0	120 UNPAVED ROADS - FUG DUST		1,000	1000 VMT	911.0	0.0	0.0	0.0	0.0
0-12-01-0	TOTAL	1			911.0	0.0	0.0	0.0	0.0
0-12-02-0	120 UNPAVED ROADS - FUG DUST		1,000	1000 VMT	911.0	0.0	0.0	0.0	0.0
0-12-02-0	TOTAL	1			911.0	0.0	0.0	0.0	0.0
0-12-03-0	120 UNPAVED ROADS - FUG DUST		1,000	1000 VMT	911.0	0.0	0.0	0.0	0.0
					911.0	0.0	0.0	0.0	0.0

SUMMARY REPORT - ACTIVITY LEVELS AND EMISSIONS

File directories: B: (Activity values)
B: (Emission factors)

DATE: 01/04/80 TIME: 7:54

Emissions in lbs. per year

Cell	Activity	Records	Total Units Divide by 2000		PM10				
0-12-04-0	103 ARTERIALS - EX B T ✓		584,000	1000 VMT	180.2	0.0	0.0	0.0	0.0
0-12-04-0	113 ARTERIALS - FUG DUST		584,000	1000 VMT	1,138.8	0.0	0.0	0.0	0.0
0-12-04-0	TOTAL	2			1,319.0	0.0	0.0	0.0	0.0
0-13-01-0	103 ARTERIALS - EX B T ✓		760,000	1000 VMT	234.5	0.0	0.0	0.0	0.0
0-13-01-0	113 ARTERIALS - FUG DUST		730,000	1000 VMT	1,423.5	0.0	0.0	0.0	0.0
0-13-01-0	TOTAL	2			1,658.0	0.0	0.0	0.0	0.0
0-13-02-0	105 LOCAL STREETS - EX B T ✓		10,000	1000 VMT	3.4	0.0	0.0	0.0	0.0
0-13-02-0	115 LOCAL STREETS - FUG DUST		10,000	1000 VMT	19.5	0.0	0.0	0.0	0.0
0-13-02-0	TOTAL	2			22.9	0.0	0.0	0.0	0.0
0-13-03-0	105 LOCAL STREETS - EX B T ✓		110,000	1000 VMT	37.8	0.0	0.0	0.0	0.0
0-13-03-0	115 LOCAL STREETS - FUG DUST		110,000	1000 VMT	214.5	0.0	0.0	0.0	0.0
0-13-03-0	120 UNPAVED ROADS - FUG DUST		4,000	1000 VMT	3,644.0	0.0	0.0	0.0	0.0
0-13-03-0	TOTAL	3			3,896.3	0.0	0.0	0.0	0.0
0-13-04-0	105 LOCAL STREETS - EX B T ✓		6,000	1000 VMT	2.1	0.0	0.0	0.0	0.0
0-13-04-0	115 LOCAL STREETS - FUG DUST		6,000	1000 VMT	11.7	0.0	0.0	0.0	0.0
0-13-04-0	120 UNPAVED ROADS - FUG DUST		4,000	1000 VMT	3,644.0	0.0	0.0	0.0	0.0
0-13-04-0	TOTAL	3			3,657.8	0.0	0.0	0.0	0.0
0-14-01-1	105 LOCAL STREETS - EX B T ✓		24,000	1000 VMT	8.2	0.0	0.0	0.0	0.0
0-14-01-1	115 LOCAL STREETS - FUG DUST		24,000	1000 VMT	46.8	0.0	0.0	0.0	0.0
0-14-01-1	120 UNPAVED ROADS - FUG DUST		3,000	1000 VMT	2,733.0	0.0	0.0	0.0	0.0
0-14-01-1	160 CLEARED AREAS - WB DUST		20,000	ACRES	420.0	0.0	0.0	0.0	0.0
0-14-01-1	TOTAL	4			3,208.0	0.0	0.0	0.0	0.0
0-14-01-2	103 ARTERIALS - EX B T ✓		110,000	1000 VMT	33.9	0.0	0.0	0.0	0.0
0-14-01-2	105 LOCAL STREETS - EX B T ✓		30,000	1000 VMT	10.3	0.0	0.0	0.0	0.0
0-14-01-2	113 ARTERIALS - FUG DUST		110,000	1000 VMT	214.5	0.0	0.0	0.0	0.0
0-14-01-2	115 LOCAL STREETS - FUG DUST		30,000	1000 VMT	58.5	0.0	0.0	0.0	0.0
0-14-01-2	120 UNPAVED ROADS - FUG DUST		2,000	1000 VMT	1,822.0	0.0	0.0	0.0	0.0
0-14-01-2	125 OFF ROAD VEHICLES		6,000	1000 VMT	390.0	0.0	0.0	0.0	0.0
0-14-01-2	160 CLEARED AREAS - WB DUST		16,000	ACRES	336.0	0.0	0.0	0.0	0.0
0-14-01-2	TOTAL	7			2,865.2	0.0	0.0	0.0	0.0
0-14-01-3	103 ARTERIALS - EX B T ✓		292,000	1000 VMT	90.1	0.0	0.0	0.0	0.0
0-14-01-3	105 LOCAL STREETS - EX B T ✓		4,000	1000 VMT	1.4	0.0	0.0	0.0	0.0
0-14-01-3	113 ARTERIALS - FUG DUST		292,000	1000 VMT	569.4	0.0	0.0	0.0	0.0
0-14-01-3	115 LOCAL STREETS - FUG DUST		4,000	1000 VMT	7.8	0.0	0.0	0.0	0.0
0-14-01-3	120 UNPAVED ROADS - FUG DUST		1,000	1000 VMT	911.0	0.0	0.0	0.0	0.0
0-14-01-3	125 OFF ROAD VEHICLES		6,000	1000 VMT	390.0	0.0	0.0	0.0	0.0
0-14-01-3	160 CLEARED AREAS - WB DUST		12,000	ACRES	252.0	0.0	0.0	0.0	0.0
0-14-01-3	TOTAL	7			2,221.7	0.0	0.0	0.0	0.0
0-14-01-4	105 LOCAL STREETS - EX B T ✓		4,000	1000 VMT	1.4	0.0	0.0	0.0	0.0
0-14-01-4	115 LOCAL STREETS - FUG DUST		4,000	1000 VMT	7.8	0.0	0.0	0.0	0.0
0-14-01-4	120 UNPAVED ROADS - FUG DUST		1,000	1000 VMT	911.0	0.0	0.0	0.0	0.0

SUMMARY REPORT - ACTIVITY LEVELS AND EMISSIONS

File directories: B: (Activity values)
B: (Emission factors)

DATE: 01/04/80 TIME: 7:54

Emissions in lbs. per year

Cell	Activity	Records	Total Units Divide by 2000		PM10				
0-14-01-4	125 OFF ROAD VEHICLES		6,000	1000 VMT	390.0	0.0	0.0	0.0	0.0
0-14-01-4	160 CLEARED AREAS - WB DUST		8,000	ACRES	168.0	0.0	0.0	0.0	0.0
0-14-01-4	TOTAL	5			1,478.2	0.0	0.0	0.0	0.0
0-14-02-1	103 ARTERIALS - EX B T ✓		182,000	1000 VMT	56.1	0.0	0.0	0.0	0.0
0-14-02-1	105 LOCAL STREETS - EX B T ✓		90,000	1000 VMT	30.9	0.0	0.0	0.0	0.0
0-14-02-1	113 ARTERIALS - FUG DUST		182,000	1000 VMT	354.9	0.0	0.0	0.0	0.0
0-14-02-1	115 LOCAL STREETS - FUG DUST		90,000	1000 VMT	175.5	0.0	0.0	0.0	0.0
0-14-02-1	120 UNPAVED ROADS - FUG DUST		7,000	1000 VMT	6,377.0	0.0	0.0	0.0	0.0
0-14-02-1	160 CLEARED AREAS - WB DUST		12,000	ACRES	252.0	0.0	0.0	0.0	0.0
0-14-02-1	221 WOOD BURNING STOVES		7,000	TONS	105.0	0.0	0.0	0.0	0.0
0-14-02-1	TOTAL	7			7,351.4	0.0	0.0	0.0	0.0
0-14-02-2	105 LOCAL STREETS - EX B T ✓		50,000	1000 VMT	17.2	0.0	0.0	0.0	0.0
0-14-02-2	115 LOCAL STREETS - FUG DUST		50,000	1000 VMT	97.5	0.0	0.0	0.0	0.0
0-14-02-2	120 UNPAVED ROADS - FUG DUST		1,000	1000 VMT	911.0	0.0	0.0	0.0	0.0
0-14-02-2	122 KENNECOTT RD - UNPAVED		7,000	1000 VMT	6,377.0	0.0	0.0	0.0	0.0
0-14-02-2	125 OFF ROAD VEHICLES		16,000	1000 VMT	1,040.0	0.0	0.0	0.0	0.0
0-14-02-2	160 CLEARED AREAS - WB DUST		16,000	ACRES	336.0	0.0	0.0	0.0	0.0
0-14-02-2	221 WOOD BURNING STOVES		3,000	TONS	45.0	0.0	0.0	0.0	0.0
0-14-02-2	TOTAL	7			8,823.7	0.0	0.0	0.0	0.0
0-14-02-3	103 ARTERIALS - EX B T ✓		580,000	1000 VMT	178.9	0.0	0.0	0.0	0.0
0-14-02-3	105 LOCAL STREETS - EX B T ✓		20,000	1000 VMT	6.9	0.0	0.0	0.0	0.0
0-14-02-3	113 ARTERIALS - FUG DUST		580,000	1000 VMT	1,131.0	0.0	0.0	0.0	0.0
0-14-02-3	115 LOCAL STREETS - FUG DUST		20,000	1000 VMT	39.0	0.0	0.0	0.0	0.0
0-14-02-3	120 UNPAVED ROADS - FUG DUST		3,000	1000 VMT	2,733.0	0.0	0.0	0.0	0.0
0-14-02-3	160 CLEARED AREAS - WB DUST		4,000	ACRES	84.0	0.0	0.0	0.0	0.0
0-14-02-3	184 TAILINGS PILES - WB DUST		40,000	ACRES	3,860.0	0.0	0.0	0.0	0.0
0-14-02-3	275 LOCOMOTIVES - EXHAUST		152,400	1000 GALLONS	1,714.5	0.0	0.0	0.0	0.0
0-14-02-3	TOTAL	8			9,747.3	0.0	0.0	0.0	0.0
0-14-02-4	103 ARTERIALS - EX B T		292,000	1000 VMT	90.1	0.0	0.0	0.0	0.0
0-14-02-4	105 LOCAL STREETS - EX B T		20,000	1000 VMT	6.9	0.0	0.0	0.0	0.0
0-14-02-4	113 ARTERIALS - FUG DUST		292,000	1000 VMT	569.4	0.0	0.0	0.0	0.0
0-14-02-4	115 LOCAL STREETS - FUG DUST		20,000	1000 VMT	39.0	0.0	0.0	0.0	0.0
0-14-02-4	120 UNPAVED ROADS - FUG DUST		3,000	1000 VMT	2,733.0	0.0	0.0	0.0	0.0
0-14-02-4	125 OFF ROAD VEHICLES		6,000	1000 VMT	390.0	0.0	0.0	0.0	0.0
0-14-02-4	160 CLEARED AREAS - WB DUST		8,000	ACRES	168.0	0.0	0.0	0.0	0.0
0-14-02-4	275 LOCOMOTIVES - EXHAUST		254,000	1000 GALLONS	2,857.5	0.0	0.0	0.0	0.0
0-14-02-4	TOTAL	8			6,853.9	0.0	0.0	0.0	0.0
0-14-03-0	103 ARTERIALS - EX B T		1,752,000	1000 VMT	540.5	0.0	0.0	0.0	0.0
0-14-03-0	105 LOCAL STREETS - EX B T		6,000	1000 VMT	2.1	0.0	0.0	0.0	0.0
0-14-03-0	113 ARTERIALS - FUG DUST		1,752,000	1000 VMT	3,416.4	0.0	0.0	0.0	0.0
0-14-03-0	115 LOCAL STREETS - FUG DUST		6,000	1000 VMT	11.7	0.0	0.0	0.0	0.0
0-14-03-0	184 TAILINGS PILES - WB DUST		208,000	ACRES	20,072.0	0.0	0.0	0.0	0.0
0-14-03-0	275 LOCOMOTIVES - EXHAUST		152,400	1000 GALLONS	1,714.5	0.0	0.0	0.0	0.0
0-14-03-0	TOTAL	6			25,757.2	0.0	0.0	0.0	0.0

SUMMARY REPORT - ACTIVITY LEVELS AND EMISSIONS

File directories: B: (Activity values)
B: (Emission factors)

DATE: 01/04/80 TIME: 7:54

Emissions in lbs. per year

Cell	Activity	Records	Total Units Divide by 2000		PM10				
0-14-04-0	103 ARTERIALS - EX B T		584,000	1000 VMT	180.2	0.0	0.0	0.0	0.0
0-14-04-0	105 LOCAL STREETS - EX B T		4,000	1000 VMT	1.4	0.0	0.0	0.0	0.0
0-14-04-0	113 ARTERIALS - FUG DUST		584,000	1000 VMT	1,138.8	0.0	0.0	0.0	0.0
0-14-04-0	115 LOCAL STREETS - FUG DUST		4,000	1000 VMT	7.8	0.0	0.0	0.0	0.0
0-14-04-0	TOTAL	4			1,328.2	0.0	0.0	0.0	0.0
0-15-01-0	103 ARTERIALS - EX B T		400,000	1000 VMT	123.4	0.0	0.0	0.0	0.0
0-15-01-0	113 ARTERIALS - FUG DUST		400,000	1000 VMT	780.0	0.0	0.0	0.0	0.0
0-15-01-0	184 TAILINGS PILES - WB DUST		224,000	ACRES	21,616.0	0.0	0.0	0.0	0.0
0-15-01-0	275 LOCOMOTIVES - EXHAUST		76,200	1000 GALLONS	857.2	0.0	0.0	0.0	0.0
0-15-01-0	TOTAL	4			23,376.6	0.0	0.0	0.0	0.0
0-15-02-0	184 TAILINGS PILES - WB DUST		192,000	ACRES	18,528.0	0.0	0.0	0.0	0.0
0-15-02-0	TOTAL	1			18,528.0	0.0	0.0	0.0	0.0
0-15-03-0	184 TAILINGS PILES - WB DUST		128,000	ACRES	12,352.0	0.0	0.0	0.0	0.0
0-15-03-0	TOTAL	1			12,352.0	0.0	0.0	0.0	0.0
0-15-04-0	184 TAILINGS PILES - WB DUST		280,000	ACRES	27,020.0	0.0	0.0	0.0	0.0
0-15-04-0	TOTAL	1			27,020.0	0.0	0.0	0.0	0.0
0-16-01-0	184 TAILINGS PILES - WB DUST		96,000	ACRES	9,264.0	0.0	0.0	0.0	0.0
0-16-01-0	TOTAL	1			9,264.0	0.0	0.0	0.0	0.0
0-16-02-0	105 LOCAL STREETS - EX B T		6,000	1000 VMT	2.1	0.0	0.0	0.0	0.0
0-16-02-0	115 LOCAL STREETS - FUG DUST		6,000	1000 VMT	11.7	0.0	0.0	0.0	0.0
0-16-02-0	TOTAL	2			13.8	0.0	0.0	0.0	0.0
0-16-03-0	105 LOCAL STREETS - EX B T		12,000	1000 VMT	4.1	0.0	0.0	0.0	0.0
0-16-03-0	115 LOCAL STREETS - FUG DUST		12,000	1000 VMT	23.4	0.0	0.0	0.0	0.0
0-16-03-0	TOTAL	2			27.5	0.0	0.0	0.0	0.0
0-16-04-0	105 LOCAL STREETS - EX B T		16,000	1000 VMT	5.5	0.0	0.0	0.0	0.0
0-16-04-0	115 LOCAL STREETS - FUG DUST		16,000	1000 VMT	31.2	0.0	0.0	0.0	0.0
0-16-04-0	TOTAL	2			36.7	0.0	0.0	0.0	0.0
0-21-01-0	105 LOCAL STREETS - EX B T		2,000	1000 VMT	0.7	0.0	0.0	0.0	0.0
0-21-01-0	115 LOCAL STREETS - FUG DUST		2,000	1000 VMT	3.9	0.0	0.0	0.0	0.0
0-21-01-0	TOTAL	2			4.6	0.0	0.0	0.0	0.0
0-22-01-0	184 TAILINGS PILES - WB DUST		60,000	ACRES	5,790.0	0.0	0.0	0.0	0.0
0-22-01-0	TOTAL	1	-		5,790.0	0.0	0.0	0.0	0.0
0-22-02-0	105 LOCAL STREETS - EX B T		20,000	1000 VMT	6.9	0.0	0.0	0.0	0.0
0-22-02-0	115 LOCAL STREETS - FUG DUST		20,000	1000 VMT	39.0	0.0	0.0	0.0	0.0
0-22-02-0	TOTAL	2			45.9	0.0	0.0	0.0	0.0
0-22-04-0	105 LOCAL STREETS - EX B T		18,000	1000 VMT	6.2	0.0	0.0	0.0	0.0
0-22-04-0	115 LOCAL STREETS - FUG DUST		18,000	1000 VMT	35.1	0.0	0.0	0.0	0.0

SUMMARY REPORT - ACTIVITY LEVELS AND EMISSIONS

File directories: B: (Activity values)
B: (Emission factors)

DATE: 01/04/80 TIME: 7:54

Emissions in lbs. per year

Cell	Activity	Records	Total Units Divide by 2000	PM10				
0-22-04-0	TOTAL	2		41.3	0.0	0.0	0.0	0.0
0-23-01-0	103 ARTERIALS - EX B T		1,750,000 1000 VMT	539.9	0.0	0.0	0.0	0.0
0-23-01-0	120 UNPAVED ROADS - FUG DUST		4,000 1000 VMT	3,644.0	0.0	0.0	0.0	0.0
0-23-01-0	TOTAL	2		4,183.9	0.0	0.0	0.0	0.0
0-23-02-0	184 TAILINGS PILES - WB DUST		64,000 ACRES	6,176.0	0.0	0.0	0.0	0.0
0-23-02-0	275 LOCOMOTIVES - EXHAUST		101,600 1000 GALLONS	1,143.0	0.0	0.0	0.0	0.0
0-23-02-0	TOTAL	2		7,319.0	0.0	0.0	0.0	0.0
0-23-03-0	105 LOCAL STREETS - EX B T		20,000 1000 VMT	6.9	0.0	0.0	0.0	0.0
0-23-03-0	115 LOCAL STREETS - FUG DUST		20,000 1000 VMT	39.0	0.0	0.0	0.0	0.0
0-23-03-0	TOTAL	2		45.9	0.0	0.0	0.0	0.0
0-23-04-0	105 LOCAL STREETS - EX B T		4,000 1000 VMT	1.4	0.0	0.0	0.0	0.0
0-23-04-0	115 LOCAL STREETS - FUG DUST		4,000 1000 VMT	7.8	0.0	0.0	0.0	0.0
0-23-04-0	TOTAL	2		9.2	0.0	0.0	0.0	0.0
0-24-01-0	105 LOCAL STREETS - EX B T		20,000 1000 VMT	6.9	0.0	0.0	0.0	0.0
0-24-01-0	115 LOCAL STREETS - FUG DUST		20,000 1000 VMT	39.0	0.0	0.0	0.0	0.0
0-24-01-0	TOTAL	2		45.9	0.0	0.0	0.0	0.0
0-24-02-0	103 ARTERIALS - EX B T		800,000 1000 VMT	246.8	0.0	0.0	0.0	0.0
0-24-02-0	105 LOCAL STREETS - EX B T		240,000 1000 VMT	82.4	0.0	0.0	0.0	0.0
0-24-02-0	113 ARTERIALS - FUG DUST		800,000 1000 VMT	1,560.0	0.0	0.0	0.0	0.0
0-24-02-0	115 LOCAL STREETS - FUG DUST		240,000 1000 VMT	468.0	0.0	0.0	0.0	0.0
0-24-02-0	221 WOOD BURNING STOVES		18,000 TONS	270.0	0.0	0.0	0.0	0.0
0-24-02-0	275 LOCOMOTIVES - EXHAUST		152,400 1000 GALLONS	1,714.5	0.0	0.0	0.0	0.0
0-24-02-0	TOTAL	6		4,341.7	0.0	0.0	0.0	0.0
0-24-03-0	103 ARTERIALS - EX B T		402,000 1000 VMT	124.0	0.0	0.0	0.0	0.0
0-24-03-0	105 LOCAL STREETS - EX B T		22,000 1000 VMT	7.6	0.0	0.0	0.0	0.0
0-24-03-0	113 ARTERIALS - FUG DUST		402,000 1000 VMT	783.9	0.0	0.0	0.0	0.0
0-24-03-0	115 LOCAL STREETS - FUG DUST		22,000 1000 VMT	42.9	0.0	0.0	0.0	0.0
0-24-03-0	TOTAL	4		958.4	0.0	0.0	0.0	0.0
	* TOTAL	180		285,159.0	0.0	0.0	0.0	0.0

Table 1

Hayden Area Cleared Area Emission Calculations

Wind Speed Class m/sec	(mph)	U, Midpoint of Wind Speed Class m/sec	(mph)	Duration hrs/yr	F gm/cm^2-sec	Emissions lbs/acre/yr
<2.1	(<4.6)	3	(6.7)	4535	nil	nil
2.1-3.6	(4.6-8.1)	2.9	(6.5)	2420	nil	nil
3.6-5.7	(8.1-12.7)	4.7	(10.5)	1292	nil	nil
5.7-9.6	(12.7-21.4)	7.7	(17.2)	482	0.64×10^{-8}	804
9.6-11.3	(21.4-25.3)	10.5	(23.5)	31	2.46×10^{-8}	200
>11.3	(>25.3)	13	(29)	0	0	0

Note: Threshold wind speed = 7.26 m/sec (Tuscon Tests)
Example calculation at 7.7 m/sec mid point wind speed

EF = F x (fetch correction) x Duration (sec) x Area (cm^2)

$F = 1.71 \times 10^{-21} U^{4.355} = 1.71 \times 10^{-21} (770)^{4.355} = 0.636 \times 10^{-8}$ gm/cm^2-sec

Fetch Correction = 1/3 (log 3.281d) = 1/3(log 3.281 x 85 m) = 0.815

Duration = 482 hrs $\frac{(3600 \text{ sec})}{\text{hr}} = 1.74 \times 10^6$

Area is 4.047×10^7 cm^2/acre

Convert to lbs = $\frac{454 \text{ gm}}{\text{lb}}$

$EF = 0.636 \times 10^{-8} (0.815)(1.74 \times 10^6)(4.047 \times 10^7) \left(\frac{1}{454}\right) = 804$ lbs/acre/yr @10.5m/sec mid-point wind speed

$EF = 2.46 \times 10^{-8} (0.815)(0.112 \times 10^6)(4.047 \times 10^7) \left(\frac{1}{454}\right) = 200$ lbs/acre/yr

Total = 1004 lbs/acre/yr

TSP = 0.75(1004) = 753 lbs/acre/day

PM_{10} = 0.055(753) = 41 lbs/acre/day

$PM_{2.5}$ = 0.0005(753) = 0.4 lbs/acre/day

Table 2

Hayden Area Tailings Pile Emission Calculations

Wind Speed Class m/sec	(mph)	U, Midpoint of Wind Speed Class m/sec	(mph)	Duration hrs/yr	F gm/cm^2-sec	Emissions lbs/acre/yr
<2.1	(<4.6)	3	(6.7)	4535	nil	nil
2.1-3.6	(4.6-8.1)	2.9	(6.5)	2420	nil	nil
3.6-5.7	(8.1-12.7)	4.7	(10.5)	1292	0.541×10^{-8}	641
5.7-9.6	(12.7-21.4)	7.7	(17.2)	482	2.3×10^{-8}	3476
9.6-11.3	(21.4-25.3)	10.5	(23.5)	31	5.7×10^{-8}	567
>11.3	(>25.3)	13	(29)	0	0	0

Note: Threshold wind speed = 5.11 m/sec
Example calculation at 4.7 m/sec mid point speed

EF = F x (fetch correction) x Duration (sec) x Area (cm^2)

$F = 7.64 \times 10^{-17}\ U\ 2.938 = 7.64 \times 10^{-17}\ (470)^{2.938} = 0.541 \times 10^{-8}\ gm/cm^2\text{-sec}$

Fetch Correction - 1 (more than 100 meters) = 0

$\text{Duration} = \frac{5.7-5.1}{5.7-3.6}\ (1292)(3600) = 1.33 \times 10^6\ \text{sec}$

Area is $4.047 \times 10^7\ cm^2/acre$

$\text{Convert to lbs} = \frac{454\ gm}{lb}$

$EF = 0.541 \times 10^{-8}\ (1)(1.33 \times 10^6)(4.047 \times 10^7)\ (\frac{1}{454}) = 641\ \text{lbs/acre/yr}$

$EF = 2.3 \times 10^{-8}\ (1)(1.7 \times 10^6)(4.047 \times 10^7)\ (\frac{1}{454}) = 3476\ \text{lbs/acre/yr}$

$EF = 5.7 \times 10_{-8}\ (1)(111600)(4.047 \times 10^7)(\frac{1}{454}) = 567\ \text{lbs/acre/yr}$

Total = 4684 lbs/acre/yr (total particulate)

TSP = 0.75(4684) = 3513 lbs/acre/year
PM_{10} = 0.055(3513) = 193 lbs/acre/year
$PM_{2.5}$ = 0.0005(3513) = 1.8 lbs/acre/year

Figure 1

Frequency Distribution (%) of Surface Wind
from Year 1983

Station ID: 23160 Station Name: Hayden-JC

Direction	Speed (knts) 1-3	4-6	7-10	11-16	17-21	>21	Total
NNE	0.11	0.19	0.15	0.05	0.00	0.00	0.54
NE	0.18	0.56	0.92	1.05	0.14	0.00	4.46
ENE	0.39	0.74	1.83	1.15	0.02	0.00	4.18
E	2.33	2.16	0.90	0.39	0.01	0.00	6.03
ESE	4.90	5.61	0.56	0.06	0.00	0.00	11.42
SE	10.04	4.75	1.04	0.08	0.02	0.00	16.27
SSE	6.32	1.75	0.34	0.03	0.00	0.00	9.11
S	5.19	0.92	0.15	0.06	0.00	0.00	7.19
SSW	3.28	0.50	0.18	0.11	0.01	0.00	4.58
SW	3.84	0.76	0.30	0.39	0.02	0.00	5.75
WSW	2.60	1.13	1.24	0.75	0.01	0.00	6.09
W	3.61	3.49	5.00	1.15	0.11	0.00	13.68
WNW	1.79	3.48	1.72	0.21	0.00	0.00	7.39
NW	0.82	1.42	0.37	0.02	0.00	0.00	2.65
NNW	0.42	0.16	0.05	0.00	0.00	0.00	0.66
N	0.01	0.00	0.00	0.00	0.00	0.00	0.01
TOTAL	45.84	27.63	14.75	5.50	0.35	0.00	94.07

Frequency of Calms: 5.93

APPENDIX F

PUBLIC HEARING
PUBLIC COMMENTS AND RESPONSIVENESS SUMMARY

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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ADEQ's proposed revision to the State Implementation Plan is required pursuant to federal regulations for the new National Ambient Air Quality Standards for PM10. The PM10 standards are 50 $\mu g/m3$ for the annual arithmetic average, and 150 $\mu g/m3$ for the 24-hour average. The effective date of the revised NAAQS was July 31, 1987.

Based on available total suspended particulate and PM10 data, the Hayden area has been classified by EPA as having a 95% probability of violating the federal PM10 standards, and is requiring the development of a pollution control plan. The draft plan describes analysis of ambient air quality, source contribution, and control strategies needed to bring Hayden into the attainment of PM10 standards.

A copy of the draft plan for the Hayden area will be available at the Air Quality Office of the Arizona Department of Environmental Quality (address below), beginning July 17, 1989. A copy of this document will also be available for review at the Hayden Library, 526 Velasco Avenue, Hayden, Arizona, during regular business hours.

All interested parties will be given a reasonable opportunity at the hearing to submit relevant evidence, data, views, and arguments, orally and in writing. All written comments must be received by 5:00 p.m. August 28, 1989 to be considered by the Department in developing the final plan. Written comments should be addressed to:

Ali Modarres
Air Quality Planning Section
Arizona Department of Environmental Quality
2005 N. Central Avenue, Room 603A
Phoenix, Arizona 85004

INVOICE NO. 09614

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Air Quality Planning Section
Arizona Department of Environmental Quality
2005 N. Central Avenue, Room 603A
Phoenix, Arizona 85004

Published: Arizona Republic, Phoenix Gazette; July 5, 1989.

AFFIDAVIT OF PUBLICAT

THE ARIZONA REPUBLIC / *The Phoenix Gazette*

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

JOAN LOHR, being first duly sworn, upon oath deposes and says: That she is the assistant legal advertising manager of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic and The Phoenix Gazette, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic
The Phoenix Gazette

July 5, 1989

July 5, 1989

Joan Lohr

Sworn to before me this

19th day of

July A.D. 19 89

OFFICIAL SEAL
MARY LEE MEASEL
NOTARY PUBLIC STATE OF ARIZONA
MARICOPA COUNTY
My Comm. Expires March 17, 1991

Mary Lee Measel
Notary Public

PUBLIC NOTICE

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Air Quality Planning Section
Arizona Department of Environmental Quality
2005 N. Central Avenue, Room 603A
Phoenix, Arizona 85004

cbn: 1pub 7-19-89
legal adv.

State of Arizona
County of Gila } ss.

James Carner being first duly sworn deposes and says:

That he is one of the publishers of the Copper Basin News, a newspaper published Weekly at Hayden, in the county of Gila, State of Arizona: that

Public Hearing

a printed copy of which is hereto attached, was published in all the regular Weekly editions of said newspaper (and not a supplement thereof) for 1 consecutive Weeks the dates of publication being as follows, to-wit:

7-19-89

James Carner

Subscribed and sworn to before me this 20th day of July, 19 89

Dorothy R. Barnley
Notary Public

My commission expires My Commission Expires June 4, 1993

JUL 06 1989

Tribune Mesa • Tempe • Chandler NEWSPAPERS

P.O BOX 1547 • MESA, ARIZONA 85211

P. O. Number: YL8008

Invoice Number: 924642

STATE OF ARIZONA
County of Maricopa

I, SUE GREEN, Legal Clerk, acknowledge that the attached hereto was published in a newspaper of general circulation at Mesa, Arizona, County of Maricopa on the following dates:

07/03 1989

M,T,C

M—Mesa C—Chandler

Sue Green

LEGAL CLERK

Subscribed and sworn to before me this date: 03-JUL-89

Cathy Jackson

NOTARY PUBLIC

OFFICIAL SEAL
CATHY JACKSON
Notary Public - Arizona
MARICOPA COUNTY
My Comm. Expires Mar. 5, 1993

AFFIDAVIT OF PUBLICATION

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
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Pub July 3, 1989 TMC-924642

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JUL 00 1989

P. O. Number: [illegible]

Invoice Number: [illegible]

STATE OF ARIZONA
County of Maricopa

I, SUE GREEN, Legal Clerk, acknowledge that the attached hereto was published in a newspaper of general circulation at Mesa, Arizona, County of Maricopa on the following dates:

07/22 1989

M—Mesa T—Tempe C—Chandler

Sue Green
LEGAL CLERK

Subscribed and sworn to before me this date: 22-JUL-89

Cathy Jackson
NOTARY PUBLIC

OFFICIAL SEAL
CATHY JACKSON
Notary Public - Arizona
MARICOPA COUNTY
My Comm. Expires Mar. 5, 1993

AFFIDAVIT OF PUBLICATION

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Pub July 3, 1989 TMC-924642

PM10 SIP - HAYDEN

PUBLIC MEETING/ORAL PROCEEDING

DATE: 8-21-89

LOCATION: HAYDEN

NAME	ADDRESS	REPRESENTING
Mark A Sandwick	Box 98 Hayden AZ 85235	ASARCO - Hayden Plant
DOUG MODROW	P.O. Box 98 Hayden AZ 85235	ASARCO- Hayden
Amy Coy	LEWIS and ROCA 100 West Washington Phoenix Az 85003-1899	ASARCO
Neil Hawkins	ASARCO Ray Unit Box 8 Hayden AZ 85235	ASARCO
Bruce Malone	ASARCO RAY UNIT Box 8 HAYDEN AZ 85235	ASARCO
Mel Sharp	ASARCO Hayden Plant	ASARCO
J.M. Aranda	P.O. Box 302 Hayden	
Eugenia Darby	P.O Box 606 Winkelman	Mayor Hayden

SPEAKER SLIP

NO: 1

DATE: 8-21-89

Name: Neil Gambell

Mailing Address: ASARCO RAY UNIT PO Box 8 Hayden Arizona 85235

Representing: ASARCO

[X] I wish to make an oral statement.
Approximate amount of time I wish to take to speak:
_____ minutes.

[] I have submitted written comments.

[] I will submit written comments immediately after speaking.

[X] I wish to submit written comments at a later time.

Subject: PM10 SIP HAYDEN

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

2005 North Central Avenue
Phoenix, Arizona 85004

PM10 Hearing for Hayden, Arizona

of the

STATE IMPLEMENTATION PLAN

BEFORE: Mr. Steve Burg, Presiding Officer

Hayden Senior Center
Hayden, Arizona
August 21, 1989
5:00 o'clock p.m.

PREPARED FOR:

COPY

CLARK AND PFEIFF
REGISTERED PROFESSIONAL REPORTERS
600 EAST BASELINE, SUITE B-5
TEMPE, ARIZONA 85283
TELEPHONE: (602) 820-4593

KATHLEEN M. INCAVO
Certified Court Reporter

1 MR. MODARRES: Good afternoon. Today is
2 Monday, August 21st, 1989, the time is 5:00 p.m. The
3 location is Hayden Senior Center in Hayden, Arizona. This
4 is a public hearing being done by the Arizona Department of
5 Environmental Quality for the purpose of explaining PM10 the
6 State Implementation Plan to reduce the particulate
7 pollution.
8 MR. BURG: My name is Steve Burg. I work at
9 the Department. The Department has asked me to be a
10 presiding officer for this public hearing. As a presiding
11 officer, it is my duty to secure comment, both oral and
12 written here today.
13 Also here from the Department are a bunch of
14 people. To my right is Nancy Wrona who is Assistant
15 Director in charge of the Department of Air Quality. Ali
16 Modarres from the Air Quality Planning Section. The Section
17 Manager for that section is Ira Domsky. Also present is
18 Wayne Leipold which is with the Department of Compliance and
19 the Regional Director. Sitting behind Wayne is Anthony
20 Leverock, Acting Manager in the Permits Unit and behind him
21 Ken Evans from the Environmental Quality Security Office for
22 the Air Quality Control Section.
23 Following the agenda, which you all picked up
24 over there, after my introduction then we will have a brief
25 summary by Ali. At that point we'll go off-the-record for a

1 brief informal question and answer session to answer basic
2 questions, make comments of the things not of the type of a
3 formal comment you want to go on-the-record and have the
4 department respond to, but this is just the chance to clear
5 up some things if you have any questions about this monster.
6 If you do wish to make a formal comment there
7 are speaker slips up there. At this point if you want to
8 grab one of the slips either before or after the hearing
9 fill it out so that we have your name and can respond to it.
10 If you have a comment, written comment you would like to
11 submit after today, you may do so up until a week from
12 today, August 28th, and hand deliver them to the department
13 or postmarked by August 28th. On the Agenda we have
14 included the address. I will go through it just once to
15 make sure.
16 Address it to Ali, A-l-i, Modarres,
17 M-o-d-a-r-r-e-s, Air Quality Planning Section. Office of
18 Air Quality, Department of Environmental Quality 2005 North
19 Central Avenue, Suite 603-A. Phoenix, Arizona, 85004. Also
20 be sure to sign the attendance sheet to get everyone. We
21 have official records which we send the response on and the
22 summaries out. You can get a copy of it that way. Now I
23 will have Ali make his presentation.
24 MR. MODARRES: Ladies and Gentlemen, thank you
25 for attending. My name is Ali Modarress, and I will give

1 you a summary of the PM10 State Implementation Plan for
2 Hayden, Arizona. I work for the Arizona Department of
3 Environmental Quality and have participated in the
4 development of the final document which was made available
5 to you for review.
6 As you are aware, Hayden has in the past
7 experienced periods of high particulate pollution problem,
8 and even though some measures have been taken to mitigate
9 the problem, the PM10 State Implementation Plan intends to
10 assure further control and compliance of this area with the
11 particulate pollution standards.
12 In my presentation, I will cover three topics:
13 A brief history of particulate standards and their adoption
14 in 1987, and the sources of the particulate pollution in the
15 Hayden area and the measures necessary to control the
16 pollution problem in this area.
17 First, a brief history of particulate
18 standards. As it was indicated in the plan itself, the 1977
19 amendments to the Clean Air Act require the Environmental
20 Protection Agency at five year intervals to review and, if
21 appropriate, revise the criteria on which each National
22 Ambient Air Quality Standard is based, along with the
23 Standards itself.
24 In accordance with these requirements of the
25 Clean Air Act, the EPA promulgated revised National Ambient

1 Air Quality Standards for particulate matter in 1987. The
2 new standards apply to particulates of 10 micrometers or
3 less in diameter and supersede the previous Total Suspended
4 Particulates Standards. The National Ambient Air Quality
5 Standards for PM10 is 50 micograms for the annual arithmetic
6 and 150 fewer to the 24-hour average.
7 Due to a lack or unavailability of PM10 data,
8 the Environmental Protection Agency developed a procedure
9 for estimating the probability of violating the PM10
10 National Ambient Air Quality Standards, using TSP and PM10
11 data wherever available. Based on the probability of
12 exceeding PM10 standards -- 24-hour and annual -- the
13 Environmental Protection Agency designated three types of
14 areas:
15 Group I areas, 95 percent probability of
16 violating the Standard. Group II areas, of 20 to 95 percent
17 percent probability of violating the Standards, and Group
18 III, less than 20 percent probability of violating the
19 Standards.
20 Based on this grouping criteria, the Hayden
21 area has been classified as Group I for the annual and
22 24-hour average PM10 National Ambient Air Quality Standards.
23 The Federal Clean Air Act requires states to develop or
24 revise their State Implementation Plans to provide for
25 implementation, maintenance and enforcement of the new PM10

1 National Ambient Air Quality Standards.

2 The State Implementation Plan, which has been
3 available for your review, and which this hearing is based
4 on, has been prepared to satisfy this federal requirement
5 for the vicinity of the Hayden area, where violations of the
6 particulate standards have been recorded. The PM10 planning
7 area for Hayden coincides with Township 5 South, Range 15
8 East.

9 Now, I would like to spend a few minutes
10 describing general activities within the area that cause the
11 particulate pollution problem.

12 The main activities within the area are
13 associated with the mining and smelting complex owned and
14 operated by ASARCO, Incorporated, rail based activities,
15 mainly locomotive exhaust, and some public and private roads
16 within the town of Hayden.

17 The ASARCO complex consists of a copper
18 crushing plant, mill and concentrator, two smelters, Hayden
19 and Ray, either of which is temporarily reactivated, and
20 associated facilities, including roads, open areas within
21 the two plants and the mineral tailings. A complete
22 description of ASARCO related activites and their relative
23 impacts are discussed in Section 7 of the Draft Plan.

24 Let me now discuss some of the measures that
25 will be taken to assure the compliance of this area with the

1 PM10 National Ambient Air Quality Standard and its
2 maintenance in the future. Since a major portion of the
3 particulate pollution is caused by the two ASARCO Plant
4 activities and their related facilities, the PM10 Plan
5 mainly emphasizes these sources and the control measures
6 that are necessary for each.
7 These are: For the first category, copper ore
8 unloading, crushing and conveying. First, we will cover the
9 process related sources. At the Dump Hopper, ASARCO will
10 replace the unused dust collector with a new one. The
11 technical specifications for this and other items is
12 provided within the PM10 plan, and therefore, I will not go
13 over them now. If they are any questions on that issue, we
14 can address them later.
15 At the Crusher Building ASARCO will replace the
16 three inefficient dust collectors with new ones. At the
17 Transfer Tower, again ASARCO will replace the existing the
18 dust collector. For all these items, ASARCO has already
19 filed Class B Installation Permits, which will be processed
20 within the calendar year 1989.
21 The second category within the same category is
22 Fugitive Dust Sources. At the Dump Hopper, ASARCO has
23 installed a spray system to reduce the dust problem and will
24 continue to operate it. And at the Crusher Building, ASARCO
25 has installed additional hooding and spray systems to

1 control dust emitted due to the drop point of one of the
2 belts and also at its transfer point into another belt.
3 This transfer point will be vented and sprayed.
4 ASARCO will also install a new dust seal on
5 their Number 5 Tripper Conveyor. ASARCO will also implement
6 new work practices to prevent re-entrainment of dust on the
7 floor of the Crusher Building by continuing a weekly
8 washdown of the lower floors and utilizing a vacuum truck on
9 the buildings' ground level and basements.
10 At the Transfer Tower, ASARCO has fabricated
11 and installed a dust hood over the conveyor, and has
12 redesigned, fabricated and installed a new hood over the
13 transfer chute between the mentioned conveyor and the one
14 that takes the material out of the Transfer Tower.
15 Additionally, spray systems have been installed
16 to reduce the chance of dust generation. ASARCO will begin
17 weekly washdowns of the transfer house floor as well. On
18 the conveyer that passes over the town, ASARCO will raise
19 the angle of the idler in order to raise the belt and push
20 it further up under the cover.
21 Additionally, this conveyer will be in an 180
22 degree enclosure in the sections that pass over Fourth
23 Street and Hillcrest Avenue and Smelter Road six months
24 after the issuance of their operating permit, which will be
25 issued in this calendar year, 1989.

1 The second category is the unpaved roads. This
2 category mainly addresses Kennecott Road and the roads
3 within the two ASARCO Plants, including the one known as
4 Canyon Drive which extends from the Crusher Building to the
5 main area of the Ray Plant.
6 ASARCO will use chemical dusts stabilizers to
7 reduce the dust generated from these sources. ASARCO will
8 also pave the storage areas which are included in these
9 areas: The concentrate storage area near the Sampling
10 Building at the Hayden Plant and the main concentrate
11 storage areas at the Hayden Plant.
12 The third category of the PM10 sources are the
13 paved areas. This category is mainly within the town of
14 Hayden. The cause of the particulate pollution problem in
15 this category is dust re-entrainment, due to the lack of
16 adequate street cleaning and the lack of curbing to prevent
17 the soil transfer from adjacent areas.
18 Due to other control measures that are
19 implemented or will be implemented, it is not necessary at
20 this time to implement any controls in this category.
21 However, in cooperation with local authorities, we will
22 reconsider our options in this area if future violations
23 occur.
24 The fourth category is locomotives. Some of
25 PM10 pollution problem is caused by locomotive operation.

1 The State Implementation Plan will require 40 percent
2 opacity limitation which can be achieved through a better
3 maintenance program for these locomotives. The 40 percent
4 opacity limit is currently proposed as a revision of the
5 State Air Quality Rules.
6 The fifth category is the off-road vehicular
7 activity in the area, and the Arizona Administrative Code
8 prohibits this type of activity. ASARCO, in cooperation
9 with the local authorities will prevent this activity from
10 occurring in the future.
11 The sixth category is the mineral tailings.
12 Even though the study conducted to determine the impact of
13 different sources on the PM10 levels in Hayden did not
14 consider this source to be a major contributor, ASARCO will
15 undertake additional measures to control dust generated at
16 the tailings area. These measures are:
17 Roads around the tailings have been or will be
18 capped with decomposed granites. Any future roads will also
19 be capped. The berms around the south and east ends of the
20 Emergency Pond and Reservoir will be capped. ASARCO will
21 also ensure that all areas of the tailings ponds are kept
22 dampened or encrusted.
23 At this point, as far as our responsibilities
24 are concerned, the State will continue to conduct ambient
25 PM10 sampling and will monitor the effectiveness of the

1 adopted control measures in the Hayden Group I area.

2 As a contingency plan, and in case further

3 control measures become necessary, the following measures

4 will be considered: Curbing the paved roads in the Hayden

5 area. The requirement of insulation of vane-type spark

6 arrestors for locomotives, and further control on the ore

7 crusher, in the case of improvements in availavle

8 technology.

9 With this final statement I thank you for

10 listening and hope that you agree with us the PM10 State

11 Implementation Plan for Hayden can significantly reduce the

12 particulate pollution in this area. Thank you.

13 MR. BURG: Thank you, Ali. We will go

14 off-the-record for the question and answer session. The

15 time is 5:15 p.m.

16 (Whereupon an off-the-record discussion

17 ensued.)

18 MR. BURG: The time the 5:27 p.m. We received

19 one speaker slip so far. Has anyone been urged to want to

20 say anything? Just the one. Neil Gambell. Did I

21 mispronounce your name? Why don't you spell your name.

22 MR. GAMBELL: N-e-i-l G-a-m-b-e-l-l. My name

23 is Neil Gambell, and I am the Technical Services

24 Administrator at the ASARCO Ray Unit on whose behalf I make

25 the following comments on the PM10 SIP for the Hayden

1 Group I area.

2 ASARCO's Ray and Hayden Plants, with the help
3 of ASARCO's technical personnel from Salt Lake City, have
4 been cooperating with the state and with EPA and its
5 contractor, Engineering Science, since 1986 to develop a
6 plan to ensure that the Hayden area becomes attainment for
7 particulate matter.

8 PM10 is EPA's new inhaleable particulate
9 standard, and the efforts that ASARCO, EPA, and the state
10 have taken are designed to see to it that the air in the
11 Hayden area meets all federal standards.

12 The public comment period closes next Monday,
13 August 28, and ASARCO intends to submit written comments on
14 some technical points that are covered in the proposed PM10
15 SIP. ASARCO supports the program that is laid out in DEQ's
16 proposal, which is based on work done by Engineering Science
17 at EPA's direction with involvement from ASARCO.

18 ASARCO's support for the program is evidenced
19 by the fact that ASARCO has already put in place many of the
20 control strategies that are outlined in DEQ's proposal.
21 The Ray Unit has completed work on many of the suggested
22 controls which include a 1.2 million dollar expenditure for
23 the installation of new dust collector units at the Crusher
24 Transfer House and the Track Hopper and the replacement of
25 3 of the 5 units at the Crusher Building. Water sprays and

1 hooding have been installed to reduce fugitive emmissions
2 from the Track Hooper, Transfer Building and the Crusher.
3 Beginning in the third quarter of 1988, the Ray
4 Unit has used a dust control agent on Kennecott Avenue as
5 well as the frequently traveled roads within the plant at a
6 cost of $35,000. We have also replaced the dust seal on the
7 Number 5 Tripper.
8 In fact, ASARCO has voluntarily agreed to some
9 extra control strategies outlined in its October 1988
10 proposal to DEQ that were believed by Engineering Science to
11 be necessary to attain the standards. DEQ has included
12 those measures voluntarily undertaken by ASARCO in its
13 proposed SIP. They include closing certain roads to traffic
14 and capping some of the tailings roads.
15 The results of ASARCO's efforts to put the
16 control strategies in place can already be seen. Even
17 before DEQ's plan is effective, EPA's new PM10 Air Quality
18 Standards are being met in Hayden. The area is well on its
19 way to becoming an attainment area.
20 ASARCO is pleased to be part of the effort to
21 imporve air quailty in the Hayden area and will continue to
22 work with DEQ to ensure attainment of air quality standards.
23 MR. BURG: Thank you. Any other formal
24 comments? Okay. I will urge you to send written comments.
25 As you just heard, until next Monday, August 28th, you can

1 hand deliver them by 5:00 p.m. Have them post marked to Ali
2 and any telephone inquiries can be directed to the
3 department at 257-6910.
4 Thank you for attending today. Your interest
5 is greatly appreciated. The time is 5:31 p.m. the 21st of
6 August, 1989. This hearing is now adjourned.
7 (Whereupon proceedings concluded at 5:31 p.m.)
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4
5 I, KATHLEEN M. INCAVO, do hereby certify that
6 the proceeding had upon the hearing of the foregoing cause
7 are contained fully and accurately in the shorthand record
8 made by me thereof, and that such shorthand was reduced to
9 writing under my direction and the foregoing 14 typewritten
10 pages of said transcript contain a full, true and correct
11 transcript of my shorthand notes taken by me as aforesaid,
12 all to the best of my skill and ability.
13 DATED this 23rd day of September, 1989, at
14 Tempe, Arizona.
15
16
17 _____
KATHLEEN M. INCAVO
18 Certified Court Reporter
19
20
21
22
23
24
25

Responsiveness Summary

The only written comments received were submitted by Ms. Amy Coy on behalf of ASARCO Inc. A copy of the original comments are provided in Appendix I of this document.

Ms. Coy has raised nine separate issues which are listed below and responded to individually:

Comment:

1. It is unclear to ASARCO exactly where and how DEQ is accounting for configuration changes currently underway at the Ray Unit crushing and concentrating facilities and the reactivation of the facilities referred to on pages 2 and 68 of the document.

Response:

After careful evaluation of the proposed changes and the possible reactivation of the Ray Smelter, we have revised the estimated emissions. These new calculations have affected other source estimations besides that of the Ray Unit crusher and concentrator. Tables 5, 6, 6.3, 6.4, 7.1, 7.2, 8.1, 8.2, 11.1, and 11.2 are modified to reflect the revised calculations. Accordingly, figures 1 and 2 are redrawn to indicate new values for 1990 and 1997. Any textual changes regarding these revisions and other matters appear in italics in the final SIP (this document).

Specifically in relation to the Ray smelter and its possible operation, we have performed the following evaluations, the results of which are reflected in the new tables.

Projections of fugitive and traffic-related PM_{10} impacts due to the Ray smelter start-up were included in the draft PM10 SIP, but are revised, however, to include only a 10 percent growth from 1990 to 1997. This is due to the fact that in our communication with local and regional authorities, we have discovered that the City of Hayden is not anticipated to grow between now and the year 2000. The projected population for the year 2000 is 1080, which is actually smaller than the existing population.

In the original calculations, emissions and consequent impact of the smelter stack and acid plant were not considered. In order to estimate emissions from these sources, Mr. Neil Gambel of the ASARCO Ray Plant was contacted. He indicated that we could assume that Ray stack emission rate would be 75 percent of the annual average emission rate for the ASARCO Hayden smelter stack, or 65.6 tons per year. Ninety percent

control of PM_{10} emissions was assumed, yielding an annual controlled emission rate of 6.6 tons per year. This emission rate was used with appropriate stack parameters in a screen model to determine a conservative maximum 24-hour average ambient concentration of 0.4 µg/m3; the resultant annual impact would be 0.1 µg/m3.

The acid plant PM_{10} emission rate was assumed to be one-fifth of the smelter stack emission rate. Combined with appropriate stack parameters, this also yielded an estimated maximum 24-hour average ambient concentration of 0.4 µg/m3 due to acid plant emissions; the resultant annual impact would also be 0.1 µg/m3.

Combining these two sources, a 24-hour average impact of 0.8 µg/m3 and an annual average of 0.2 µg/m3 are estimated. Since Ray smelter is not expected to restart prior to 1990, these values are only added to those for 1997.

Comment:

2. The SIP document inaccurately states on pages 2 and 68 that the referenced deactivation began in 1980. In fact, the decision to put those operations on care and maintenance status took effect in June 1982.

Response:

Appropriate texts are modified to reflect June 1982 as the deactivation date.

Comment:

3. ASARCO questions the appropriateness of the increase in "background" concentration shown on tables 6 and 7 since, as we understand it, background is intended to be that which occurs naturally and is based upon data gathered at the pristine Organ Pipe National Monument.

Response:

The new tables reflect no growth in the background value.

Comment:

4. ASARCO believes that the use of the word "banked" in discussions in sections 6.2 and 6.3 is inaccurate.

Response:

This word has been removed from the final document.

Comment:

5. ASARCO is unclear as to what the Department intends to encompass in its projection of an increase in emission from "traffic", specifically whether this projection is to include traffic only in the public areas, or traffic on plant property as well.

Response:

Figures obtained from the Department of Commerce indicate that the city of Hayden will not see any population growth between now and the year 2000. This indicates that if the traffic was solely a function of the population of Hayden's residents, no emissions growth would be necessary; however, the growth of the plant will have an impact not only on the traffic level on the plant roads, but also on the public roads within the city of Hayden. For that reason, the emission growth for the paved and unpaved roads is presumed to occur on both the private and the public roads.

Comment:

6. ASARCO requests that the reference to a specific number of gallons per minute be deleted from the spray system (See pages 80 and 81) requirements. It is argued that ASARCO is actually experimenting with different sizes, and also that the 1.4 gpm seems to create a problem by spraying too much water, rather than the desired mist.

Response:

The size specification for the spray systems is removed from the final SIP (this document); however, required efficiency remains unchanged. It is the intention of this document to primarily reduce the particulate emissions, and ADEQ believes that size specification is a matter that can be determined by ASARCO. It should be clear at this point, that by the time the operating permit is issued, the final decision of size specification should be reached. This technical information is necessary for creating an easily enforceable permit and also for decreasing the amount of paper work and record keeping for the ASARCO Ray Plant.

Comment

7. In the discussion on page 36 and tables on pages 37 and 38, it is unclear to ASARCO whether references are intended to be to "silicon" (Si) or to "silica" (SiO_2).

Response:

The correct text is "silicon" (Si). The text has been modified to reflect the correction.

Comment:

8. Storage areas may not be amenable to asphalt paving but require concrete or another surface. ASARCO intends to use the most appropriate paving method for each particular application.

Response:

This document does not specify the type of paving required. ASARCO can choose any paving material that it finds suitable for these areas, so long as the proposed efficiency is not lowered. As in the response to the comment regarding the spray systems, we would like to request that ASARCO submit to ADEQ their final decision as to the types of material which will be used and their application schedule.

Comment:

9. This comment is divided into 3 different sections for the purpose of more individualized responses.

a. ASARCO questions our approach in imposing emission limitations and control strategies that are not contained in the Arizona Administrative Code.

b. Using the permit conditions in lieu of adopted rules will result in a SIP that is not federally enforceable, and hence, not approvable.

c. Since the Hayden SIP relies mainly on control strategies derived from ASARCO's operating and installation permits, ADEQ did not have the authority to hold the public hearing. Furthermore, if the hearing was held unlawfully, Section 110 requirement was not satisfied, and hence, the SIP is not approvable.

Response:

a. ADEQ has made its general policy clear that in the industrial PM10 Group I areas, the SIP control strategies will be enforced through conditions contained in appropriate operating and installation permits. We believe that rule adoptions through amendments to the Arizona Administrative Code are not intended for an area by area basis. However, we plan to adopt new rules regarding point and nonpoint sources which would address all areas of Arizona, rather than any Group I area separately.

b. As far as federal enforceability is concerned, we have discussed the matter with EPA and it has been made clear to us that, while relying on a permit is not the most preferable approach, it is an acceptable one. This type of SIP is not unprecedented. Furthermore, installation permits,

which address a major category of PM10 pollution in the Hayden Area (Ray Unit crusher and concentrator), are federally enforceable, and therefore are accepted as a part of a SIP.

c. ARS §49-424.A.5. provides clear authority to the Arizona Department of Environmental Quality to hold hearing on the draft SIP. Therefore, we believe that the Section 110 requirement is satisfied.

State statute does not specifically forbid ADEQ from holding public hearings operating permits. Also, the permit, itself was not the subject of the hearing.

APPENDIX G

COPIES OF WRITTEN COMMENTS

LEWIS AND ROCA
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A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS
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PAUL M. ROCA (1911-1979)
EDWIN BEAUCHAMP (1916-1964)

AUG 29 1989

OUR FILE NUMBER 28245-001

WRITER'S DIRECT LINE 602-262-5792

August 28, 1989

HAND-DELIVER

Mr. Ali Modarres, Air Quality Planner
Planning Section, Office of Air Quality
Department of Environmental Quality
2005 North Central Avenue, Suite 603A
Phoenix, Arizona 85004

Re: PM-10 State Implementation Plan (SIP) for the Hayden Area

Dear Mr. Modarres:

This letter constitutes the written comments of our client, ASARCO Incorporated, on the proposed PM-10 SIP for the Hayden, Arizona, area, which was the subject of a public hearing in Hayden, Arizona, on August 21, 1989. Representatives of ASARCO's Hayden and Ray Units attended the hearing, and Neil Gambell, Technical Services Administrator of the Ray Unit, presented oral testimony in support of the control strategies contained in the proposed SIP.

As pointed out in Mr. Gambell's testimony, ASARCO has worked closely with the Arizona Department of Environmental Quality, the Environmental Protection Agency, and EPA's contractor in the development of this proposed SIP. ASARCO believes, based upon its own calculations, that adoption of the control strategies outlined in the proposed SIP will result in attainment of the PM-10 air quality standards. Because DEQ's approach to calculating the source category contributions and attainment demonstrations differs slightly from ASARCO's, ASARCO is not in a position to agree or disagree with each and every projection in the tables contained in the proposed SIP document. ASARCO does, however, agree with DEQ's overall conclusion that implementing the proposed control strategies will result in attainment.

0239k*

As Mr. Gambell described in his oral presentation at the public hearing in Hayden, many of the control strategies outlined in the proposed SIP document have already been implemented voluntarily by ASARCO. As part of the SIP implementation process, ASARCO will be submitting to DEQ an update to the table found at pages 103-04 of the proposed SIP to indicate which of the outlined control strategies are already in place and the projected completion dates of the other strategies. The actually demonstrated PM-10 attainment that has resulted from these actions is impressive. Since ASARCO began phasing in the new control measures last summer, the Department of Environmental Quality's PM-10 monitors in the area have now recorded four consecutive quarters without an exceedance of the PM-10 standards. ASARCO believes that this trend will continue. This practical proof of the theoretical demonstrations made by Engineering Sciences, DEQ, and ASARCO is gratifying to ASARCO and, we believe, to DEQ and the Hayden area residents.

In addition to its general endorsement of the control strategies, ASARCO has the following technical points/questions that it believes need resolution in DEQ's final action on the SIP document:

1. It is unclear to ASARCO exactly where and how DEQ is accounting for configuration changes currently underway at the Ray Unit crushing and concentrating facilities and the reactivation of the facilities referred to on pages 2 and 68 of the document.

2. The SIP document inaccurately states on pages 2 and 68 that the referenced deactivation began in 1980. In fact, the decision to put those operations on care and maintenance status took effect in June 1982.

3. ASARCO questions the appropriateness of the increase in "background" concentration shown on tables 6 and 7 since, as we understand it, background is intended to be that which occurs naturally and is based upon data gathered at the pristine Organ Pipe National Monument. See, discussion at page 54 of proposed SIP document.

4. ASARCO believes that the use of the word "banked" in discussions in sections 6.2 and 6.3 is inaccurate.

5. ASARCO is unclear what the Department intends to encompass in its projection of an increase in emissions from "traffic", specifically whether this projection is to include

only traffic in the public areas or includes traffic on plant property, as well.

6. In its discussion of control strategy, the proposed SIP refers to the installation of water sprays of 1.4 gpm each. See discussion at pages 80 and 81. ASARCO requests that the reference to a specific number of gallons per minute be deleted. ASARCO has now had a period of actual experience with the spray systems contemplated under the proposed control strategy and has found that at 1.4 gallons per minute the "sprays" form a stream of water rather than the desired mist. ASARCO is experimentally replacing the 1.4 gpm sprays with .5 and .75 gpm sprays, and will ultimately install and use the most effective ones.

7. In the discussion on page 36 and tables on pages 37 and 38, it is unclear to ASARCO whether references are intended to be to "silicon" (Si) or to "silica" (SiO_2).

8. In the discussion of control strategies for unpaved roads at page 93, the draft SIP refers to paving certain storage areas at the Hayden plant, noting that those areas in which front-end loaders are used are not amenable to control by surfactants. Those same areas may not be amenable to asphalt paving but may require concrete or another surface. ASARCO intends to use the most appropriate paving method for each particular application.

Finally, ASARCO wishes to state for the record its position that the Department's means of implementing the proposed PM-10 SIP may be defective. The Department intends to impose emission limitations and other control strategies that are not found in the Arizona Administrative Code and that in some cases conflict with existing code provisions. For example, under the PM-10 SIP scrubbers installed at the Ray Unit will be required to meet a grain-loading standard of 0.05 gr/dfcf. By regulation, this "unclassified source" is required to meet a process weight rate rather than a grain-loading standard. See, A.A.C. R18-2-502. As ASARCO has pointed out to the Department in earlier meetings and conversations, it is not appropriate or lawful to "amend" regulations through conflicting permit conditions. ASARCO does not object to the imposition of the 0.05 gr/dfcf grain-loading standard, merely to its method of imposition.

Furthermore, ASARCO believes that the Department's approach will result in the imposition of conditions that are

not federally enforceable and, therefore, can hardly be called part of a State Implementation Plan under the Clean Air Act. The proposed PM-10 plan itself, although adopted after notice and public hearing, is not an operative document as it relates to ASARCO. It merely outlines the steps the Department intends to take in order to implement the PM-10 process. Since the PM-10 State Implementation Plan for the Hayden "Group I" area will not be a rule or regulation, it cannot directly impose a burden on the Company. (ASARCO also questions whether the Department had the authority to hold the public hearing in the first place. If it did not, then the requirements of § 110 that every state implementation plan be adopted after notice and public hearing would not be met.)

The method by which DEQ intends to make its purported SIP "enforceable" is by placing its conditions in an operating permit. Even assuming DEQ has the authority to impose the conditions outlined in the proposed "SIP" through the permit process rather than by rulemaking, it has long been EPA's position that "operating permits" as that term is used in Arizona, are not federally enforceable documents. If EPA is correct, then valid operating permit conditions could only be enforced against ASARCO by the Department of Environmental Quality, and the PM-10 SIP would not be an approvable SIP at all.

It is for these reasons that in the October 1988 draft proposed SIP it submitted to DEQ and EPA, ASARCO suggested that the control strategies be adopted as amendments to the Arizona Administrative Code.

Again, we wish to emphasize that ASARCO does not object to installing the control strategies outlined. In fact, it has already incurred significant expense in putting those controls in place. ASARCO merely wishes to point out for the record that it does not concede the validity of the procedure being followed by DEQ and requests that DEQ reconsider its approach.

ASARCO appreciates the opportunity to submit these comments and will continue working with DEQ to ensure the attainment of PM-10 NAAQS in the Hayden area. If ASARCO can provide any further information to DEQ in its finalization of the PM-10 SIP for the Hayden area, please let us know.

Sincerely,

Amy R. Coy

ARC/jw

0239k*

APPENDIX H

ASARCO'S OPERATING AND INSTALLATION PERMITS

APPENDIX I

RELATED ARIZONA ADMINISTRATIVE CODE

ARTICLE 1. DEFINITIONS

R18-2-101. Definitions

In these Rules the following definitions in this Section shall govern, unless the context otherwise requires, and unless in conflict with a definition given in A.A.C. Title 9, Ch. 3, Article 8, New Source Performance Standards, or in Article 9, Hazardous Air Pollutant Standards. In such case, the definitions given in Articles 8 or 9 shall apply only to sources covered by those Articles, and the definitions given in this Section shall govern elsewhere.

1. "Acid mist" means sulfuric acid mist as measured by Method 8 in the Arizona Stack Testing Manual.

2. "Act" means the Clean Air Act, 42 U.S.C.A. § 7401 *et seq.*

3. "Actual emissions" means the actual rate of emissions of a pollutant from an emissions unit, as determined in accordance with Subparagraphs a. through c. below.

a. In general, actual emissions as of a particular date shall equal the average rate, in tons per year, at which the unit actually emitted the pollutant during a two-year period which precedes the particular date and which is representative of normal source operation. The Director may allow the use of a different time period upon a determination that it is more representative of normal source operation. Actual emissions shall be calculated using the unit's actual operating hours, production rates, and types of materials processed, stored or combusted during the selected time period.

b. Lacking specific information to the contrary, the Director may presume that source-specific allowable emissions for the unit are equivalent to the actual emissions of the unit.

c. For any emissions unit which has not begun normal operations on the particular date, actual emissions shall equal the potential to emit of the unit on that date.

4. "Administrator" means the Administrator of the United States Environmental Protection Agency.

5. "Affected facility" means, with reference to a stationary source, any apparatus to which a standard is applicable.

6. "Air pollution control equipment" means equipment used to eliminate, reduce or control the emission of air pollutants into the ambient air.

7. "Air quality control region" (AQCR) means an area so designated by the Administrator pursuant to Section 107 of the Federal Clean Air Act as amended, and includes:

a. Maricopa Intrastate Air Quality Control Region which is comprised of the County of Maricopa in Arizona.

b. Pima Intrastate Air Quality Control Region which is comprised of the County of Pima in Arizona.

c. Northern Arizona Intrastate Air Quality Control Region which encompasses the counties of Apache, Coconino, Navajo and Yavapai in Arizona.

d. Mojave-Yuma Intrastate Air Quality Control Region which encompasses the counties of Mohave and Yuma in Arizona.

e. Central Arizona Intrastate Air Quality Control Region which encompasses the counties of Gila and Pinal in Arizona.

f. Southeast Arizona Intrastate Air Quality Control Region which encompasses the counties of Cochise, Graham, Greenlee and Santa Cruz in Arizona.

8. "Allowable emissions" means the emission rate of a stationary source calculated using the maximum rated capacity of the source (unless the source is subject to Federally enforceable limits which restrict the operating rate, or hours of operation, or both) and the most stringent of the following:

a. The applicable new source performance standards or National Emission Standards for Hazardous Air Pollutants, as contained in A.A.C. Title 9, Ch. 3, Articles 8 or 9;

b. The applicable existing source performance standard, as approved for the Arizona SIP and contained in Article 5 of these Rules; or,

c. The emissions rate specified in any Federally promulgated rule or Federally enforceable permit conditions applicable to the State of Arizona.

9. "Alternative method" means any method of sampling and analyzing for an air pollutant which is not a reference or equivalent method but which has been demonstrated to the Director's satisfaction to, in specific cases, produce results adequate for the Director's determination of compliance.

10. "Ambient air" means that portion of the atmosphere, external to buildings, to which the general public has access.

11. "Architectural coating" means a coating used commercially or industrially for residential, commercial or industrial buildings and their appurtenances, structural steel and other fabrications such as, but not limited to, storage tanks, bridges, beams and girders.

12. "Arizona Testing Manual" means the Arizona Testing Manual for Air Pollutant Emissions.

13. "ASME" means American Society of Mechanical Engineers. All ASME test methods referenced as guides in these Rules shall be those methods adopted on or before June 1, 1980.

14. "Asphalt concrete plant" means any facility, as described in R18-2-508, used to manufacture asphalt concrete by heating and drying aggregate and mixing with asphalt cements.

15. "ASTM" means American Society for Testing and Materials. All ASTM test methods referenced as guides in these Rules shall be those methods adopted on or before June 1, 1980.

16. "Attainment area" means an area so designated by the Administrator acting pursuant to Section 107 of the Act as having ambient air pollutant concentration equal to or less than national primary or secondary ambient air quality standards for a particular pollutant or pollutants.

17. "Baseline area" means any area, within any intrastate area (and every part thereof) designated as attainment or unclassifiable in which the major

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source or major modification establishing the baseline date would construct or would have an air quality impact equal to or greater than 1 ug/m^3 (annual average) of the pollutant for which the baseline date is established. Area redesignations under Section R18-2-217 cannot intersect or be smaller than the area of impact of any new major source or major modification which:

a. Establishes a baseline date; or

b. Is subject to 40 CFR 52.21 (or Section R18-2-304 after approval by the Administrator for inclusion in the Arizona SIP), and would be constructed in Arizona.

18. "Baseline concentration" means that ambient concentration level which exists in the baseline area at the time of the applicable baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established and shall include:

a. The actual emissions representative of sources in existence on the applicable baseline date, except as provided in Subparagraph c., below;

b. The allowable emissions of major stationary sources which commenced construction before January 6, 1975, but were not in operation by the applicable baseline date;

c. The following will not be included in the baseline concentration and will affect the applicable maximum allowable increase(s):

i. Actual emissions from any major stationary source on which construction commenced after January 6, 1975; and

ii. Actual emissions increases and decreases at any stationary source occurring after the baseline date.

19. "Baseline date" means the earliest date after August 7, 1977, that:

a. A major stationary source or major modification submits a complete permit application to the Administrator under 40 CFR 52.21; or,

b. A major stationary source or major modification submits a complete permit application to the Director under the applicable portions of Article 3 and Appendix 1 subsequent to their approval by the Administrator and integration into the Arizona SIP.

c. The baseline date is established for each pollutant for which increments or other equivalent measure have been established if:

i. The area in which the proposed source or modification would construct is designated as attainment or unclassifiable on the date of its complete application under Subparagraph a. or b., above, as applicable; and,

ii. In the case of a major stationary source, the pollutant would be emitted in significant amounts, or in the case of a major modification, there would be a significant net emissions increase of the pollutant.

20. "Begin actual construction" means, in general, initiation of physical on-site construction activities on an emissions unit which are of a permanent nature. Such activities include, but are not limited to, installation of building supports and foundations, laying of underground pipework, and construction of permanent storage structures. With respect to a change in method of operation this

term refers to those on-site activities, other than preparatory activities, which mark the initiation of the change.

21. "Best available control technology" (BACT) means an emission limitation (including a visible emissions standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the Director, on a case-by-case basis, taking into account energy, environmental and economic impact and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques, for control of such pollutant. In no event shall such application of BACT result in emissions of any pollutant, which would exceed the emissions allowed by any applicable new source performance standard or National Emission Standard for Hazardous Air Pollutants under A.A.C. Title 9, Ch. 3, Articles 8 and 9. If the Director determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.

22. "Black liquor" means waste liquor from the brown stock washer and spent cooking liquor which have been concentrated in the multiple effect evaporator system.

23. "Btu" means British thermal unit which is the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

24. "Bureau" means the Office of Air Quality within the Department of Environmental Quality.

25. "Calcine" means the solid materials produced by a roaster.

26. "Calorie" means the quantity of heat required to raise the temperature of one gram of water one degree Celsius.

27. "Capacity factor" means the ratio of the average load on a machine or equipment for the period of time considered to the capacity rating of the machine or equipment.

28. "Capture system" means the equipment (including ducts, hoods, fans, dampers, etc.) used to capture or transport particulate matter or gases generated by a process source to the air pollution control device.

29. "Categorical sources" means the following classes of sources:

a. Coal cleaning plants (with thermal dryers);
b. Kraft pulp mills;
c. Portland cement plants;
d. Primary zinc smelters;

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e. Iron and steel mills;
f. Primary aluminum ore reduction plants;
g. Primary copper smelters;
h. Municipal incinerators capable of charging more than 250 tons of refuse per day;
i. Hydrofluoric, sulfuric, or nitric acid plants;
j. Petroleum refineries;
k. Lime plants;
l. Phosphate rock processing plants;
m. Coke oven batteries;
n. Sulfur recovery plants;
o. Carbon black plants (furnace process);
p. Primary lead smelters;
q. Fuel conversion plants;
r. Sintering plants;
s. Secondary metal production plants;
t. Chemical process plants;
u. Fossil-fuel boilers (or combination thereof) totaling more than 250 million Btu's per hour heat input;
v. Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
w. Taconite preprocessing plants;
x. Glass fiber processing plants;
y. Charcoal production plants;
z. Fossil fuel-fired steam electric plants of more than 250 million Btu's per hour heat input.

30. "CFR" means Code of Federal Regulations. Standard references in these Rules and Regulations is by Title and Part, i.e., "40 CFR 51" means "Title 40 of the Code of Federal Regulations, Part 51".

31. "Charge" means the addition of metal bearing materials, scrap, or fluxes to a furnace, converter or refining vessel.

32. "Coal" means all solid fossil fuels classified as anthracite, bituminous, subbituminous, or lignite by ASTM Designation D-388-66.

33. "Combustion" means the burning of matter.

34. "Commence" as applied to construction of a major stationary source or major modification, means that the owner or operator has all necessary preconstruction approvals or permits and either has:

a. Begun, or caused to begin, a continuous program of actual on-site construction of the source, to be completed within a reasonable time; or

b. Entered into binding agreements or contractual obligations, which cannot be cancelled or modified without substantial loss to the owner or operator, to undertake a program of actual construction of the source to be completed within a reasonable time.

35. "Complete" means, in reference to an application for a permit, that the application contains all the information necessary for processing the application. Designating an application complete for purposes of permit processing does not preclude the Director from requesting or accepting any additional information.

36. "Condensate stripper system" means a column, and associated condensers used to strip, with air or steam, TRS compounds from condensate streams from various processes within a kraft pulp mill.

37. "Construction" means any physical change or change in the method of operation (including fabrication, erection, installation, demolition, or modification of an emissions unit) which would result in a change in actual emissions.

38. "Continuous monitoring system" means the total equipment, required under the emission monitoring Subsections in applicable Sections, used to sample and condition (if applicable), to analyze, and to provide a permanent record of emission or process parameters.

39. "Control device" means the air pollution control equipment used to remove particulate matter or gases generated by a process source from the effluent gas stream.

40. "Copper concentrate" means enriched copper ore recovered from the froth flotation process.

41. "Copper concentrate dryer" means any facility in which a copper sulfide ore concentrate charge is heated in the presence of air to eliminate a portion of the moisture from the charge, provided less than five (5) percent of the sulfur contained in the charge is eliminated in the facility.

42. "Copper concentrate roaster" means any facility in which a copper sulfide ore concentrate is heated in the presence of air to eliminate a significant portion (five percent or more) of the sulfur contained in the charge.

43. "Copper converter" means any vessel to which copper matte is charged and oxidized to copper.

44. "Copper matte" means a metallic sulfide made by smelting copper sulfide ore concentrate or the roasted product of copper sulfide ores.

45. "Copper reverberatory smelting furnace" means any vessel in which the smelting of copper sulfide ore concentrates or calcines is performed and in which the heat necessary for smelting is provided primarily by combustion of a fossil fuel.

46. "Copper smelting" means processing techniques for the smelting of a copper sulfide ore concentrate or calcine charge leading to the formation of separate layers of molten slag, molten copper, and/or copper matte.

47. "Copper smelting furnace" means any vessel in which the smelting of copper sulfide ore concentrates or calcines is performed and in which the heat necessary for smelting is provided by an electric current, rapid oxidation of a portion of the sulfur contained in the concentrate as it passes through an oxidizing atmosphere, or the combustion of a fossil fuel.

48. "Department" means the Department of Environmental Quality.

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49. "Director" means the Director of the Department of Environmental Quality.

50. "Discharge" means the release or escape from the source of an effluent into the atmosphere.

51. "Dispersion technique" means any technique which attempts to affect the concentration of a pollutant in the ambient air by using that portion of a stack which exceeds good engineering practice stack height, varying the rate of emission of a pollutant according to atmospheric conditions of ambient concentrations of that pollutant, or by addition of a fan or reheater to obtain a less stringent emission limitation. The preceding sentence does not include:

a. The reheating of a gas stream, following use of a pollution control system, for the purpose of returning the gas to the temperature at which it was originally discharged from the facility generating the gas stream;

b. The use of smoke management in agricultural or silvicultural programs;

c. Combining the exhaust gases from several stacks into one stack.

52. "Dust" means finely divided solid particulate matter occurring naturally or created by mechanical processing, handling or storage of materials in the solid state.

53. "Dust suppressant" means a chemical compound or mixture of chemical compounds added with or without water to a dust source for purposes of preventing air entrainment.

54. "Effluent" means any air contaminant which is emitted and subsequently escapes into the atmosphere.

55. "Elevated terrain" means terrain which exceeds the top elevation of the good engineering practice stack as calculated under Definition 76 of this Section.

56. "Emission" means an air contaminant or gas stream or the act of discharging an air contaminant or a gas stream, visible or invisible.

57. "Emission standard" means a regulation (or portion thereof) setting forth an allowable rate of emissions, level of opacity, or prescribing equipment or fuel specifications that result in control of air pollution emissions.

58. "Emissions unit" means any part of a stationary source which emits or would have the potential to emit any pollutant subject to regulation under this Chapter.

59. "Equivalent method" means any method of sampling and analyzing for an air pollutant which has been demonstrated to the Director's satisfaction to have a consistent and quantitatively known relationship to the reference method, under specified conditions.

60. "Excess emissions" or "emissions in excess of an emission limitation" means emissions of an air pollutant in excess of an emission standard as measured by the compliance test method applicable to such emission standard.

61. "Excessive concentrations" for the purpose of determining good engineering practice stack height in a fluid model or field study means a maximum concentration due to downwash, wakes, or eddy effects produced by structures

or terrain features which is at least 40 percent in excess of the maximum concentration experienced in the absence of such downwash, wakes, or eddy effects.

62. "Existing source" means any source which commenced replacement, erection, installation or making a major alteration of the type described in R18-2-301 (installation permit) prior to May 14, 1979.

63. "Existing source performance standards" means emission standards applicable to existing sources.

64. "Facility" means an identifiable piece of stationary process equipment along with all associated air pollution equipment.

65. "Federal Land Manager" means, with respect to any lands in the United States, the Secretary of the department with authority over such lands.

66. "Federally enforceable" means all limitations and conditions which are enforceable by the Administrator. This includes but is not limited to the requirements of the New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants contained in A.A.C. Title 9, Ch. 3, Articles 8 and 9; the requirements of such other State or County rules or regulations approved by the Administrator for inclusion in the Arizona SIP; and the requirements of any Federal regulation promulgated by the Administrator as part of the Arizona SIP.

67. "Fixed capital cost" means the capital needed to provide all the depreciable components.

68. "Fossil fuel-fired steam generator" means a furnace or boiler used in the process of burning fossil fuel for the primary purpose of producing steam by heat transfer.

69. "FR" means Federal Register. Standard reference in these Rules and Regulations is by Volume, Page and Date, i.e., "43 FR 46246, October 5, 1978" means "Volume 43 of the Federal Register of October 5, 1978 at page 46246".

70. "Fuel" means any material which is burned for the purpose of producing energy.

71. "Fuel burning equipment" means any machine, equipment, incinerator, device or other article, except stationary rotating machinery, in which combustion takes place.

72. "Fugitive dust" means fugitive emissions of particulate matter.

73. "Fugitive emissions" means those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening.

74. "Fume" means solid particulate matter resulting from the condensation and subsequent solidification of vapors of melted solid materials.

75. "Gasoline" means any petroleum distillate having a Reid vapor pressure of four (4) pounds or more.

76. "Good engineering practice (GEP) stack height" means the greater of:

a. 213.25 feet (65 meters);

b. Other stacks;

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i. For stacks in existence on January 12, 1979 and for which the owner or operator had obtained all applicable preconstruction permits or approvals required under 40 CFR Parts 51 and 52 and A.A.C. R18-2-301, $H_g = 2.5H$,

ii. For all other stacks,

$H_g = H + 1.5L$, where

H_g = good engineering practice stack height, measured from the ground-level elevation at the base of the stack,

H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack,

L = lesser dimension (height or projected width) of nearby structure(s);

c. The height demonstrated by a fluid model or a field study approved by the reviewing agency, which ensures that the emissions from a stack do not result in excessive concentrations of any air pollutant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, structures, or terrain obstacles.

77. "Hazardous air pollutant" means an air pollutant to which no Arizona ambient air quality standard is applicable and which in the judgment of the Director causes, or contributes to, air pollution which may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness.

78. "Hearing Board" means the Air Pollution Control Hearing Board.

79. "Heat input" means the quantity of heat in terms of Btu's generated by fuels fed into the fuel burning equipment under conditions of complete combustion.

80. "High terrain" means any area having an elevation of nine hundred (900) feet or more above the base of the stack of a source.

81. "Incinerator" means any equipment, machine, device, contrivance or other article and all appurtenances thereof used for the combustion of refuse, salvage materials or any other combustible material except fossil fuels. Such combustion shall be for the purpose of reducing the volume of material.

a. Multiple chamber incinerator: A multiple chamber incinerator consists of three or more refractory-lined combustion chambers in series, physically separated by refractory walls and interconnected by gas passage ports or ducts.

b. Controlled atmosphere incinerator: A controlled atmosphere incinerator consists of one or more refractory-lined chambers in which complete combustion is promoted by recirculation of gases by mechanical means.

c. Wood waste burner: A wood waste burner is an incinerator designed and used exclusively for the burning of wood wastes consisting of wood slabs, scraps, shavings, barks, sawdust or other wood material. Generation of steam as a by-product shall not affect the classification of the device as an incinerator.

d. Air curtain destructor: An air curtain destructor is an incineration device designed and used to secure, by means of a fan generated air curtain, controlled combustion of only wood waste and slash materials in an earthen trench or refractory-lined pit or bin.

e. Afterburner: An afterburner is an incinerator installed in the secondary combustion chamber or stack for the purpose of incinerating smoke, fumes, gases, unburned carbon, and other combustible material not consumed during primary combustion.

f. Fume incinerator: A fume incinerator is a device similar to an afterburner installed for the purpose of incinerating fumes, gases and other finely divided combustible particulate matter not previously burned.

82. "Indian governing body" means the governing body of any tribe, band, or group of Indians subject to the jurisdiction of the United States and recognized by the United States as possessing power of self-government.

83. "Indian reservation" means any Federally recognized reservation established by Treaty, Agreement, Executive Order, or Act of Congress.

84. "Innovative control technology" means any system of air pollution control that has not been adequately demonstrated in practice, but would have a substantial likelihood of achieving greater continuous emissions reduction than any control system in current practice or of achieving at least comparable reductions at lower cost in terms of energy, economics, or nonair quality environmental impacts.

85. "Isokinetic sampling" means sampling in which the linear velocity of the gas entering the sampling nozzle is equal to that of the undisturbed gas stream at the sample point.

86. "Kraft pulp mill" means any stationary source which produces pulp from wood by cooking (digesting) wood chips in a water solution of sodium hydroxide and sodium sulfide (white liquor) at high temperature and pressure. Regeneration of the cooking chemicals through a recovery process is also considered part of the kraft pulp mill.

87. "Kraft pulp mill digester system" means each continuous digester or each batch digester used for the cooking of wood in the white liquor, and associated flash tank(s), blow tank(s), chip streamer(s), and condenser(s).

88. "Lead" means elemental lead or alloys in which the predominant component is lead.

89. "Lime hydrator" means a unit used to produce hydrated lime product.

90. "Lime kiln" means a unit used to calcine lime rock or kraft pulp mill lime mud which consists primarily of calcium carbonate, into quicklime, which is calcium oxide.

91. "Lime manufacturing plant" includes any plant which produces a lime product from limestone by calcination. Hydration of the lime product is also considered to be part of the source.

92. "Lime product" means the product produced by the calcination process including, but not limited to, calcitic lime, dolomitic lime, and deadburned dolomite.

93. "Lowest achievable emission rate" (LAER) means, for any source, the more stringent rate of emissions based on the following:

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a. The most stringent emissions limitation which is contained in the SIP of any state for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or,

b. The most stringent emissions limitation which is achieved in practice by such class or category of stationary source. This limitation, when applied to a modification, means the lowest achievable emissions rate for the new or modified emissions units within the stationary source. In no event shall the application of this term permit a proposed new or modified stationary source to emit any pollutant in excess of the amount allowable under applicable new source standards of performance as contained in A.A.C. Title 9, Chapter 3, Articles 8 and 9.

94. "Low terrain" means any area other than high terrain.

95. "Major modification" means any physical change in or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under this Chapter.

a. Any net emissions increase that is significant for volatile organic compounds shall be considered significant for ozone.

b. For the purposes of this definition the following shall not be considered a physical change or change in the method of operation:

i. Maintenance, repair and replacement which the Director determines to be routine.

ii. Use of an alternative fuel or raw material by reason of an order under Sections 2 (a) and (b) of the Energy Supply and Environmental Coordination Act of 1974 (or any superseding legislation) or by reason of a natural gas curtailment plan pursuant to the Federal Power Act;

iii. Use of an alternative fuel by reason of an order or rule under Section 125 of the Act;

iv. Use of an alternative fuel at a steam generating unit to the extent that the fuel is generated from municipal solid waste;

v. Use of an alternative fuel or raw material by a stationary source which:

(1) The source was capable of accommodating before January 6, 1975, unless such change would be prohibited under any Federally enforceable permit condition which was established after January 6, 1975, pursuant to 40 CFR 52.21, or under R18-2-302 or R18-2-304 subsequent to their approval by the Administrator as part of the Arizona SIP.

(2) The source is approved to use under any permit issued under 40 CFR 52.21, or under R18-2-302 or R18-2-304 subsequent to their approval by the Administrator as part of the Arizona SIP.

vi. An increase in the hours of operation or in the production rate, unless such change would be prohibited under any Federally enforceable permit condition which was established after January 6, 1975, pursuant to 40 CFR 52.21, or

under R18-2-302 or R18-2-304 subsequent to their approval by the Administrator as part of the Arizona SIP.

vii. Any change in ownership at a stationary source.

c. In these Rules and Regulations the terms "major modification" and "major alteration" are synonymous and interchangeable.

96. "Major stationary source" means:

a. Any stationary source located in a nonattainment area which emits, or has the potential to emit, 100 tons per year or more of any pollutant subject to regulation under the Act; or,

b. Any stationary source located in an attainment or unclassifiable area which emits, or has the potential to emit, 100 tons per year or more of any pollutant subject to regulation under the Act if the source is classified as a Categorical Source, or 250 tons per year or more of any pollutant subject to regulation under the Act if the source is not classified as a Categorical Source; or,

c. Any change to a minor source which would increase its emissions to the qualifying levels specified under Subparagraphs a. or b., above.

d. A major stationary source that is major for volatile organic compounds shall be considered major for ozone.

e. In these Rules and Regulations the terms "major stationary source" and "major source" are synonymous and interchangeable unless the context otherwise requires.

97. "Malfunction" means any sudden and unavoidable failure of air pollution control equipment or process equipment or a process to operate in a normal and usual manner. Failures that are caused by poor maintenance, careless operation or any other upset condition or equipment breakdown which could have been prevented by the exercise of reasonable care shall not be considered malfunctions.

98. "Minor source" means a source of air pollution which is not a major source and over which the Director, acting pursuant to A.R.S. § 36-1706.B, has asserted jurisdiction.

99. "Miscellaneous metal parts and products" for purposes of industrial coating mean:

a. Large farm machinery (harvesting, fertilizing and planting machines, tractors, combines, etc.);

b. Small farm machinery (lawn and garden tractors, lawn mowers, rototillers, etc.);

c. Small appliances (fans, mixers, blenders, crock pots, dehumidifiers, vacuum cleaners, etc.);

d. Commercial machinery (office equipment, computers and auxiliary equipment, typewriters, calculators, vending machines, etc.);

e. Industrial machinery (pumps, compressors, conveyor components, fans, blowers, transformers, etc.);

f. Fabricated metal products (metal covered doors, frames, etc.); and

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g. Any other industrial category which coats metal parts or products under the Standard Industrial Classification Code of Major Group 33 (primary metal industries), Major Group 34 (fabricated metal products), Major Group 35 (non-electric machinery), Major Group 36 (electrical machinery), Major Group 37 (transportation equipment), Major Group 38 (miscellaneous instruments), and Major Group 39 (miscellaneous manufacturing industries), except:

i. Automobiles and light-duty tracks;
ii. Metal cans;
iii. Flat metal sheets and strips in the form of rolls or coils;
iv. Magnet wire for use in electrical machinery;
v. Metal furniture;
vi. Large appliances;
vii. Exterior of airplanes;
viii. Automobile refinishing;
ix. Customized top coating of automobiles and trucks, if production is less than 35 vehicles per day; and,
x. Exterior of marine vessels.

100. "Mobile or portable sources" mean combustion engines, machinery, and equipment which are capable of being operated in more than one county. The Director shall have original jurisdiction over these sources unless delegated in writing and shall be the sole arbiter in defining mobile or portable sources.

101. "Molybdenum roaster" means any facility in which a molybdenum sulfide ore concentrate charge is heated in the presence of air to eliminate a significant portion (5 percent or more) of the sulfur contained in the charge.

102. "Monitoring device" means the total equipment, required under the monitoring of operations sections in applicable subparts, used to measure and record (if applicable) process parameters.

103. "Motor vehicle" means any self-propelled vehicle designed for transporting persons or property on public highways.

104. "Multiple-effect evaporator system" means the multiple-effect evaporators and associated condenser(s) and hotwell(s) used to concentrate the spent cooking liquid that is separated from the pulp (black liquor).

105. "Nearby" as used in the GEP definition is that distance up to five times the lesser of the height or the width dimension of a structure but not greater than 0.8 km (one-half mile). The height of the structure is measured from the ground-level elevation at the base of the stack.

106. "Necessary preconstruction approvals or permits" means those permits or approvals required under Federal air quality control laws and regulations and those air quality control laws and regulations which are part of the Arizona SIP.

107. "Net emissions increase" means the amount by which the sum of the following exceeds zero:

a. Any increase in actual emissions from a particular physical change or change in the method of operation at a stationary source; and

b. Any other increases and decreases in actual emissions at the source that are contemporaneous with the particular change and are otherwise creditable.

c. An increase or decrease in actual emissions is contemporaneous with the increase from the particular change only if it occurs between:

i. The date five years before construction on the particular change commences; and

ii. The date that the increase from the particular change occurs.

d. An increase or decrease in actual emissions is creditable only if the Director has not relied on it in issuing an installation or operating permit, which permit is in effect when the increase in actual emissions from the particular change occurs.

e. An increase or decrease in actual emissions of sulfur dioxide or particulate matter which occurs before the applicable baseline date is creditable only if it is required to be considered in calculating the amount of maximum allowable increases remaining available.

f. An increase in actual emissions is creditable only to the extent that the new level of actual emissions exceeds the old level.

g. A decrease in actual emissions is creditable only to the extent that:

i. The old level of actual emissions or the old level of allowable emissions, whichever is lower, exceeds the new level of actual emissions;

ii. It is Federally enforceable at and after the time that actual construction on the particular change begins; and,

iii. It has approximately the same qualitative significance for public health and welfare as that attributed to the increase from the particular change.

h. An increase that results from a physical change at a source occurs when the emissions unit on which construction occurred becomes operational and begins to emit a particular pollutant. Any replacement unit that requires shakedown becomes operational only after a reasonable shakedown period, not to exceed 180 days.

108. "Neutral sulfite semichemical pulping operation" means any operation in which pulp is produced from wood by cooking (digesting) wood chips in a solution of sodium sulfite and sodium bicarbonate, followed by mechanical defibrating (grinding).

109. "New source" means any major stationary source of air pollution, the construction or modification of which was commenced after May 14, 1979.

110. "New source performance standards" means the emission limitations or other performance requirements for sources or major alterations contained in A.A.C. Title 9, Chapter 3, Article 8 (New Source Performance Standards).

111. "Nitric acid plant" means any facility producing nitric acid 30 to 70 percent in strength by either the pressure or atmospheric pressure process.

112. "Nitrogen oxides" means all oxides of nitrogen except nitrous oxide, as measured by test methods set forth in the Arizona Testing Manual.

113. "Nonattainment area" means an area so designated by the Administrator acting pursuant to Section 107 of the Act (42 U.S.C.A. § 7401) as

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exceeding national primary or secondary ambient air standards for a particular pollutant or pollutants.

114. "Nonpoint source" means a source of air contaminants which lacks an identifiable plume or emission point.

115. "Opacity" means the degree of obscuration of transmitted light.

116. "Operation" means any physical or chemical action resulting in the change in location, form, physical properties or chemical character of a material.

117. "Owner or operator" means any person who owns, leases, operates, controls, or supervises an affected facility or a stationary source of which an affected facility is a part.

118. "Particulate matter" means for mass emissions testing, any finely divided liquid or solid material, other than uncombined water, as measured by the test methods and procedures described in R18-2-310.

119. "Percent opacity" means the degree to which an effluent plume or other emission obscures the transmission of light.

120. "Person" includes any public or private corporation, company, partnership, firm, association or society of persons, the Federal government and any of its departments or agencies, the State and any of its agencies, departments or political subdivisions, as well as a natural person.

121. "Petroleum liquids" means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery but does not mean Number 2 through Number 6 fuel oils as specified in ASTM D-396-69, gas turbine fuel oils Numbers 2-GT through 4-GT as specified in ASTM D-2880-71, or diesel fuel oils Numbers 2-D and 4-D as specified in ASTM D-975-68.

122. "Photochemically reactive solvent" means a solvent with an aggregate of more than twenty percent of its total volume composed of the chemical compounds classified below or which exceeds any of the following percentage composition limitations, referred to the total volume of solvent:

a. A combination of the following types of compounds having an olefinic or cyclo-olefinic type of unsaturation — hydrocarbons, alcohols, aldehydes, esters, ethers, or ketones: five percent;

b. A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene: eight percent;

c. A combination of ethylbenzene, ketones having branched hydrocarbon structures, trichlorethylene or toluene: twenty percent,

d. Whenever any organic solvent or any constituent of an organic solvent may be classified from its chemical structure into more than one of the above groups or organic compounds, it shall be considered as a member of the most reactive chemical group, that is, that group having the least allowable percent of the total volume of solvents.

123. "Plume" means visible effluent.

124. "Plume impaction" means concentrations measured or predicted to occur when the plume interacts with elevated terrain.

125. "Pollutant" means an air contaminant the emission or ambient concentration of which is regulated pursuant to these Rule and Regulations.

126. "Potential to emit" or "potential emission rate" means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is Federally enforceable. Secondary emissions do not count in determining the potential to emit of a stationary source.

127. "Primary ambient air quality standards" means the ambient air quality standards which define levels of air quality which the Administrator judges are necessary, with an adequate margin of safety, to protect the public health.

128. "Process" means one or more operations, including equipment and technology, used in the production of goods or services or the control of by-products or waste.

129. "Process source" means the last operation or process which produces an air contaminant resulting from

a. The separation of the air contaminants from the process material, or

b. The conversion of constituents of the process materials into air contaminants and which is not an air pollution abatement operation.

130. "Process weight" means the total weight of all materials introduced into a process source, including fuels, where these contribute to pollution generated by the process.

131. "Process weight rate" means a rate established as follows:

a. For continuous or long run, steady-state process sources, the total process weight for the entire period of continuous operation or for a typical portion thereof, divided by the number of hours of such period or portion thereof.

b. For cyclical or batch process sources, the total process weight for a period which covers a complete operation or an integral number of cycles, divided by the hours of actual process operation during such period.

c. The total process weight from all similar units employing a similar type process shall be used in determining the maximum allowable emission of particulate matter.

132. "Proportional sampling" means sampling at a rate that produces a constant ratio of sampling rate to stack gas flow rate.

133. "Reasonably available control technology" (RACT) equals for facilities subject to an existing source performance standards the emissions limitation of the existing source performance standard.

134. "Reclaiming machinery" means any machine, equipment device or other article used for picking up stored granular material and depositing this material on a conveyor or reintroducing this material into the process.

135. "Reconstruction" of sources located in nonattainment areas will be presumed to have taken place where the fixed capital cost of the new

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components exceeds 50 percent of the fixed capital cost of a comparable entirely new stationary source. Any final decision as to whether reconstruction has occurred shall be made in accordance with the provisions of 40 CFR 60.15(f)(1)-(3). A reconstructed stationary source will be treated as a new stationary source for purposes of nonattainment area source review. In determining lowest achievable emission rate for a reconstructed stationary source, the provisions of 40 CFR 60.15(f)(4) shall be taken into account in assessing whether a new source performance standard is applicable to such stationary source.

136. "Recovery furnace" means the unit used for burning black liquor to recover chemicals consisting primarily of sodium carbonate and sodium sulfide. The recovery furnace includes the direct-contact evaporator for a conventional furnace. "Old design furnaces" are those without welded wall construction or emission-control designed air systems. "New design furnaces" include both welded wall construction and emission-control design air systems. "Cross recovery furnaces" burn combined neutral sulfite waste liquor and black liquor.

137. "Reference method" means the methods of sampling and analyzing for an air pollutant as described in the Arizona Testing Manual.

138. "Reid vapor pressure" is the absolute vapor pressure of volatile crude oil and volatile non-viscous petroleum liquids, except liquified petroleum gases, as determined by ASTM-D-323-59 (reapproved 1968).

139. "Resource recovery facility" means any facility at which solid waste is processed for the purpose of extracting, converting to energy, or otherwise separating and preparing solid waste for reuse. Energy conversion facilities must utilize solid waste to provide more than 50 percent of the heat input to be considered a resource recovery facility under this Chapter.

140. "Rotary lime kiln" means a unit with an included rotary drum which is used to produce a lime product from limestone by calcination.

141. "Run" means the net period of time during which an emission sample is collected. Unless otherwise specified, a run may be either intermittent or continuous within the limits of good engineering practice.

142. "Secondary ambient air quality standards" means the ambient air quality standards which define levels of air quality which the Administrator judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

143. "Secondary emissions" means emissions which would occur as a result of the construction or operation of a major stationary source or major modification, but do not come from the major stationary source or major modification itself. For the purpose of these Regulations, secondary emissions must be specific, well defined, quantifiable, and impact the same general area as the stationary source or modification which causes the secondary emissions. Secondary emissions may include, but are not limited to:

a. Emission from trains coming to or from the new or modified stationary source; and,

b. Emissions from any offsite support facility which would not otherwise be constructed or increase its emissions as a result of the construction or operation of the major stationary source or major modification.

144. "Shutdown" means the cessation of operation of any air pollution control equipment or process equipment for any purpose, except routine phasing out of process equipment.

145. "Significance levels" means the following ambient concentrations for the enumerated pollutants:

		Averaging Time			
Pollutant	**Annual**	**24-Hour**	**8-Hour**	**3-Hour**	**1-Hour**
SO_2	2 ug/m^3	5 ug/m^3		25 ug/m^3	
TSP	5 ug/m^3	10 ug/m^3			
NO_2	2 ug/m^3				
CO			0.5 mg/m^3		3 mg/m^3

Except for the annual poll concentrations, exceedance of significance levels shall occur when the ambient concentrations of the above pollutants will be exceeded more than once per year at any one location. Significance levels shall be deemed not to have been exceeded for any of the above-enumerated pollutants if such concentrations occur at a specific location and at a time when Arizona ambient air quality standards for such pollutant would not be violated.

146. "Significant" means, in reference to a net emissions increase or the potential of a source to emit any of the following pollutants, a rate of emissions that would equal or exceed any of the following rates:

Pollutant	**Emissions Rate**
Carbon monoxide	100 tons per year (tpy)
Nitrogen oxides	40 tpy
Sulfur dioxide	40 tpy
Particulate matter	25 tpy
Ozone	40 tpy (VOC)
Lead	0.6 tpy
Asbestos	0.007 tpy
Beryllium	0.0004 tpy
Mercury	0.1 tpy
Vinyl chloride	1 tpy
Fluorides	3 tpy
Sulfuric acid mist	7 tpy
Hydrogen sulfide (H_2S)	10 tpy
Total reduced sulfur (including H_2S)	10 tpy
Reduced sulfur compounds (including H_2S)	10 tpy

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"Significant" means, in reference to a net emissions increase or the potential of a source to emit a pollutant subject to regulation under this Chapter that is not listed above, any emission rate. Notwithstanding the emission amount listed above, "significant" means any emissions rate or any net emissions increase associated with a major stationary source or major modification, which would construct within 10 kilometers of a Class I area and have an impact on the ambient air quality of such area equal to or greater than 1 ug/m^3 (24-hour average).

147. "Slag" means the more or less completely fused and vitrified matter separated during the reduction of a metal from its ore.

148. "Smelt dissolving tank" means a vessel used for dissolving the smelt collected from the kraft mill recovery furnace.

149. "Smelter feed" means all materials utilized in the operation of a copper smelter including metals or concentrates, fuels and chemical reagents and shall be calculated as the aggregate sulfur content of all fuels and other feed materials whose products of combustion and gaseous by-products are emitted to the atmosphere.

150. "Smoke" means particulate matter resulting from incomplete combustion.

151. "Soot" means the carbonaceous particulate product of incomplete combustion which may be a component of smoke.

152. "Stack" means any point in a source designated to emit solids, liquids, or gases into the air, including a pipe or duct but not including flares.

153. "Standard" means a standard of performance promulgated under these Rules.

154. "Standard conditions" means a temperature of 293K (68°F or 20°C) and a pressure of 101.3 kilopascals (29.92 in. Hg or 1013.25mb).

155. "Start-up" means the setting into operation of any air pollution control equipment or process equipment for any purpose except routine phasing in of process equipment.

156. "State implementation plan" (SIP) means the plan adopted by the State of Arizona which provides for implementation, maintenance, and enforcement of such primary and secondary ambient air quality standards as are adopted by the administrator.

157. "Stationary rotating machinery" means any gas engine, diesel engine, gas turbine, or oil fired turbine operated from a stationary mounting and used for the production of electric power or for the direct drive of other equipment.

158. "Stationary source" means any building, structure, facility or installation which emits or may emit any air pollutant subject to regulation under this Chapter.

a. The following are not considered stationary sources for purposes of these Regulations:

i. Motor vehicles.

ii. Fuel burning equipment which, in the aggregate with such other equipment of the applicant at the same location of property, other than a one or two family residence, is rated at less than 500,000 Btu's per hour.

iii. Agricultural vehicles or agricultural equipment used in normal farm operations.

b. "Building", "structure", "facility", or "installation" means, for sources located in attainment areas, all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same first two digit code) as described in the "Standard Industrial Classification Manual, 1972", as amended by the 1977 Supplement (U.S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0, respectively).

c. "Building", "structure", or "facility" means, for sources located in nonattainment areas, all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same two digit code) as described in the "Standard Industrial Classification Manual, 1972", as amended by the 1977 Supplement (U.S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0, respectively).

d. "Installation" means, for sources located in nonattainment areas, an identifiable piece of process equipment.

159. "Statutory major source" means a stationary source which is capable of generating more than 75 tons of uncontrolled air contaminants per day or, having less emissions, has been designated as a class by the Director to be a major source. The following classifications have been so designated by the Director:

a. The smelting of copper ore.

b. The refining of crude oil.

160. "Sulfuric acid plant" means any facility producing sulfuric acid by the contact process by burning elemental sulfur, alkylation acid, hydrogen sulfide, or acid sludge, but does not include facilities where conversion to sulfuric acid is utilized as a means of preventing emissions of sulfur dioxide or other sulfur compounds to the atmosphere.

161. "Supplementary control system" (SCS) means a system by which sulfur dioxide emissions are curtailed during periods when meteorological conditions conducive to ground-level concentrations in excess of ambient air quality standards for sulfur dioxide either exist or are anticipated.

162. "Total reduced sulfur" (TRS) means the sum of the sulfur compounds, primarily hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl

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disulfide, that are released during the kraft pulping operation and measured by Method 16 in the Arizona Testing Manual.

163. "Unclassified area" means an area which the Administrator, because of a lack of adequate data, is unable to classify as an attainment or nonattainment area for a specific pollutant. For purposes of this Chapter unclassified areas are to be treated as attainment areas.

164. "Uncombined water" means condensed water containing analytical trace amounts of other chemical elements or compounds.

165. "Urban or suburban open area" means an unsubdivided tract of land surrounding a substantial urban development of a residential, industrial, or commercial nature and which, though near or within the limits of some city or town, may be used for agriculture, be uncultivated, or lie fallow.

166. "Vacant lot" means a subdivided residential or commercial lot which contains no buildings or structures of a temporary or permanent nature.

167. "Vapor" means the gaseous form of a substance normally occurring in a liquid or solid state.

168. "Vapor pressure" means the pressure exerted by the gaseous form of a substance in equilibrium with its liquid or solid form.

169. "Visible emissions" means any emissions which are visually detectable without the aid of instruments and which contain particulate matter.

170. "Volatile organic compound" (VOC) means any organic compound (except the compounds enumerated below) that, when released into the atmosphere, can remain long enough to participate in photochemical reactions. Methane; Ethane; 1,1,1,-Trichloroethane (Methyl Chloroform); Trichlorotrifluoroethane (Freon 113); and Methelene Chloride are not considered to be volatile organic compounds for purposes of regulation under this Chapter.

171. "Volatility" means the capability of a substance to vaporize or change to the vapor form.

Historical Note

Former Section R9-3-101 repealed, new Section R9-3-101 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Editorial correction, Paragraph 133. (Supp. 80-1). Editorial correction, Paragraph 58. (Supp. 80-2). Amended eff. July 9, 1980. Amended by adding new Paragraphs 24., 55., 102., 115. and renumbering accordingly, eff. Aug. 29, 1980 (Supp. 80-4). Amended eff. May 28, 1982 (Supp. 82-3). Amended eff. Sept. 22, 1983 (Supp. 83-5). Amended Paragraph 133., added Paragraph 156. and renumbered accordingly eff. Sept. 28, 1984 (Supp. 84-5). Amended Paragraph 29. by deleting aa. and bb. eff. Aug. 9, 1985 (Supp. 85-4). Former Section R9-3-101 renumbered without change as R18-2-101 (Supp. 87-3).

ARTICLE 2. AMBIENT AIR QUALITY STANDARDS

R18-2-201. Particulate matter

A. The primary ambient air quality standards for particulate matter are:

1. 75 micrograms per cubic meter – annual geometric mean.

2. 260 micrograms per cubic meter – maximum 24-hour concentration not to be exceeded more than once per year.

B. The secondary ambient air quality standards for particulate matter are:

1. 60 micrograms per cubic meter – annual geometric mean, as a guide to be used in assessing implementation plans to achieve the 24-hour standard.

2. 150 micrograms per cubic meter – maximum 24-hour concentration not to be exceeded more than once per year.

Historical Note

Amended eff. Dec. 22, 1976 (Supp. 76-5). Former Section R9-3-201 repealed, new Section R9-3-201 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Editorial correction, Subsection E. (Supp. 80-2). Amended eff. Aug. 29, 1980 (Supp. 80-4). Amended B.1., deleted C. through E. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-201 renumbered without change as Section R18-2-201 (Supp. 87-3).

R18-2-202. Sulfur oxides (sulfur dioxide)

A. The primary ambient air quality standards for sulfur oxides, measured as sulfur dioxide, are:

1. 80 micrograms per cubic meter (0.03 ppm) – annual arithmetic mean.

2. 365 micrograms per cubic meter (0.14 ppm) – maximum 24-hour concentration not to be exceeded more than once per year.

B. The secondary ambient air quality standard for sulfur oxides measured as sulfur dioxide is 1300 micrograms per cubic meter (0.5 ppm) maximum 3-hour concentration not to be exceeded more than once per year.

Historical Note

Amended eff. Dec. 22, 1976 (Supp. 76-5). Former Section R9-3-202 repealed, new Section R9-3-202 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. Aug. 29, 1980 (Supp. 80-4). Amended Subsection B. eff. May 28, 1982 (Supp. 82-3). Amended by deleting Subsections C. through E. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-202 renumbered without change as Section R18-2-202 (Supp. 87-3).

R18-2-203. Reserved

R18-2-204. Ozone

The primary and secondary ambient air quality standard for ozone is 0.12 ppm (235 micrograms per cubic meter). The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm (235 micrograms per cubic meter) is equal to or less than one (1), as determined by 40 CFR 50, Appendix H.

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Historical Note

Amended eff. Dec. 22, 1976 (Supp. 76-5). Former Section R9-3-204 repealed, new Section R9-3-204 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. Aug. 29, 1980 (Supp. 80-4). Amended by deleting Subsections B. through D. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-204 renumbered without change as Section R18-2-204 (Supp. 87-3).

R18-2-205. Carbon monoxide

The primary and secondary ambient air quality standards for carbon monoxide are:

1. 10 milligrams per cubic meter (9 ppm) – maximum 8-hour concentration not to be exceeded more than once per year.
2. 40 milligrams per cubic meter (35 ppm) – maximum 1-hour concentration not to be exceeded more than once per year.

Historical Note

Amended eff. Dec. 22, 1976 (Supp. 76-5). Former Section R9-3-205 repealed, new Section R9-3-205 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. Aug. 29, 1980 (Supp. 80-4). Amended by deleting Subsections B. through D. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-205 renumbered without change as Section R18-2-205 (Supp. 87-3).

R18-2-206. Nitrogen dioxide

The primary and secondary ambient air quality standard for nitrogen dioxide is 100 micrograms per cubic meter (0.05 ppm) – annual arithmetic mean.

Historical Note

Amended eff. Dec. 22, 1976 (Supp. 76-5). Former Section R9-3-206 repealed, new Section R9-3-206 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. Aug. 29, 1980 (Supp. 80-4). Amended by deleting Subsections B. through D. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-206 renumbered without change as Section R18-2-206 (Supp. 87-3).

R18-2-207. Lead

The primary and secondary ambient air quality standard for lead and its compounds, measured as elemental lead, is 1.5 micrograms per cubic meter, maximum arithmetic mean averaged over a calendar quarter.

Historical Note

Former Section R9-3-207 repealed eff. May 14, 1979 (Supp. 79-1). New Section R9-3-207 adopted eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. Aug. 29, 1980 (Supp. 80-4). Amended by deleting Subsections B. through D. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-207 renumbered without change as Section R18-2-207 (Supp. 87-3).

R18-2-208.

Reserved

R18-2-214.

R18-2-215. Ambient air quality monitoring methods and procedures

A. Only those methods which have been either designated by the Administrator as reference or equivalent methods or approved by the Director shall be used to monitor ambient air.

B. Quality assurance, monitor siting, and sample probe installation procedures shall be in accordance with procedures described in "Air Quality Monitoring Procedures Manual", Arizona Department of Health Services, September, 1982 (adopted herewith and on file with the Office of the Secretary of State). The Director may approve other procedures upon a finding that the proposed procedures are substantially equivalent or superior to procedures in the Manual. The Manual shall not apply to continuous sulfur dioxide monitoring performed by copper smelters which operate supplementary control systems because such monitoring is subject to the requirements of R18-2-704.

Historical Note

Adopted eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-215 renumbered without change as Section R18-2-215 (Supp. 87-3).

R18-2-216. Interpretation of ambient air quality standards and evaluation of air quality data

A. Unless otherwise specified, interpretation of all ambient air quality standards contained in this Article shall be in accordance with 40 CFR 50 as in effect on June 18, 1980.

B. The evaluation of air quality data in terms of procedure, methodology, and concept is to be consistent with methods described in Appendix 10 to this Chapter.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-216 repealed, new Section R9-3-216 adopted eff. Aug. 29, 1980 (Supp. 80-4). Former Section R9-3-216 renumbered without change as Section R18-2-216 (Supp. 87-3).

R18-2-217. Attainment areas; classification and standards

A. Designation and classification of attainment areas.

1. All attainment and unclassified areas or parts thereof shall be classified as either Class I, Class II or Class III.

2. All of the following areas which were in existence on August 7, 1977, shall be Class I areas irrespective of attainment status and may not be redesignated:

a. International parks;

b. National wilderness areas which exceed 5,000 acres in size;

c. National memorial parks which exceed 5,000 acres in size; and

d. National parks which exceed 6,000 acres in size.

3. The following areas may be designated only as Class I or II:

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a. An area which as of August 7, 1977, exceeds 10,000 acres in size and is a national monument, a national primitive area, a national preserve, a national recreational area, a national wild and scenic river, a national wildlife refuge, a national lakeshore or seashore.

b. A national park or national wilderness area established after August 7, 1977, which exceeds 10,000 acres in size.

4. All other areas shall be Class II areas unless redesignated under Subparagraph 5. or 6.

5. The Governor or his designee may redesignate areas of the State Class I or Class II, provided that:

a. At least one public hearing is held in or near the area affected;

b. Other states, Indian governing bodies and Federal Land Managers, whose land may be affected by the proposed redesignation are notified at least 30 days prior to the public hearing.

c. A discussion of the reasons for the proposed redesignation including a description and analysis of health, environmental, economic, social and energy effects of the proposed redesignation is prepared by the Governor or his designees and is made available for public inspection at least 30 days prior to the hearing and the notice announcing the hearing contains appropriate notification of the availability of such discussion.

d. In redesignating any area under this Section with respect to which any Federal Land Manager has submitted written comments and recommendations, the Governor or his designee shall publish a list of any inconsistency between such redesignation and such recommendations, together with the reasons for making such redesignation against the recommendation of the Federal Land Manager.

e. The proposed redesignation is based on the record which must reflect the basis for the proposed redesignation, including consideration of

i. Growth anticipated in the area,

ii. The social, environmental, health, energy and economic effects of such redesignation and upon other areas and states,

iii. Any impacts of such proposed redesignation upon regional or national interests, and

iv. Testimony submitted at the public hearing.

f. The redesignation is proposed after consultation with the elected leadership of local and other substate general purpose governments in the area covered by the proposed redesignation.

6. The Governor or his designee may redesignate areas of the State Class III if:

a. Such redesignation meets the requirements of Paragraph 5. of this Section;

b. Such redesignation has been approved after consultation with the appropriate committee of the legislature if it is in session or with the leadership of the legislature if it is not in session, and if the general purpose units of local

government representing a majority of the residents of the area so redesignated concur in the redesignation;

c. Such redesignation will not cause, or contribute to, concentration of any air pollutant which exceeds any maximum allowable increase or maximum allowable concentration permitted under the classification of any area;

d. Prior to any public hearing on redesignation of any area, there shall be available insofar as is practicable for public inspection any specific plans for any new major stationary source or modification of such source which may be permitted to be constructed and operated only if the area in question is redesignated as Class III.

B. Limitation of pollutants in classified attainment areas.

1. Areas designated as Class I, II, or III shall be limited to the following increases in air pollutant concentrations occurring over the baseline concentration; provided that for any period other than an annual period, the applicable maximum allowable increase may be exceeded once per year at any one location.

	Maximum Allowable Increase (Micrograms per cubic meter)
CLASS I	
Particulate matter:	
Annual geometric mean	5
24-hour maximum	10
Sulfur dioxide:	
Annual arithmetic mean	2
24-hour maximum	5
3-hour maximum	25
CLASS II	
Particulate matter:	
Annual geometric mean	19
24-hour maximum	37
Sulfur dioxide:	
Annual arithmetic mean	20
24-hour maximum	91
3-hour maximum	512
CLASS III	
Particulate matter:	
Annual geometric mean	37
24-hour maximum	75
Sulfur dioxide:	
Annual arithmetic mean	40
24-hour maximum	182
3-hour maximum	700

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2. The maximum allowable concentration of any air pollutant in any area to which the preceding Paragraph applies shall not exceed a concentration for each pollutant equal to the concentration permitted under the Arizona State Ambient Air Quality Standards contained in this Article (Article 2).

3. For purposes of determining compliance with the maximum allowable increases in ambient concentrations of an air pollutant, the following concentrations of such pollutant shall not be taken into account:

a. Concentration of such pollutant attributable to the increase in emissions from major and stationary sources which have converted from the use of petroleum products, or natural gas, or both, by reason of natural gas curtailment order which is in effect under the provisions of Sections 2(a) and (b) of the Energy Supply and Environmental Coordination Act of 1974 (15 U.S.C. § 792) (or any subsequent legislation which supersedes such provisions) over the emissions from such sources before the effective date of such order;

b. The concentration of such pollutant attributable to the increase in emissions from major and stationary sources which have converted from using gas by reason of a natural gas curtailment plan in effect pursuant to the Federal Power Act (U.S.C.A., Title 16, Chapter 12) over the emissions from such sources before the effective date of such plan;

c. Concentrations of particulate matter attributable to the increase in emissions from construction or other temporary activities of a new or altered source;

d. The increase in concentrations attributable to new sources outside the United States over the concentrations attributable to existing sources which are included in the baseline concentration;

e. Concentrations attributable to the temporary increase in emissions of sulfur dioxide or particulate matter from major stationary sources when the following conditions are met:

i. The operating permit(s) issued to such sources specifies the time period during which the temporary emissions increase of sulfur dioxide or particulate matter would occur. Such time period shall not be renewable and shall not exceed two years unless a longer period is specifically approved by the Director.

ii. No emissions increase will be approved which would:

(1) Impact any portion of any Class I area or any portion of any other area where an applicable incremental ambient standard is known to be violated in that portion; or

(2) Cause or contribute to the violation of a State ambient air quality standard.

iii. The operating permit(s) issued to such sources specify that at the end of the time period described in Subdivision i., above, the emissions levels from the sources would not exceed the levels occurring before the temporary emissions increase was approved.

f. The exception granted with respect to increment consumption under 3.a. and b. of this Section shall not apply more than five years after the effective date of the order or plan on which the exception is based.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Editorial correction, Subsection A., Paragraph 5., Subparagraph d. (Supp. 80-2). Amended eff. May 28, 1982 (Supp. 82-3). Former Section R9-3-217 renumbered without change as Section R18-2-217 (Supp. 87-3).

R18-2-218. Violations

One exceedance per year of the ambient air quality standards in this Article, except for the annual and quarterly standards, and the standard for ozone, shall be allowed for each pollutant at each monitoring site. Each additional exceedance at each site shall constitute a violation of ambient air quality standards.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-218 repealed, new Section R9-3-218 adopted eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-218 renumbered without change as Section R18-2-218 (Supp. 87-3).

R18-2-219. Air pollution emergency episodes

A. Procedures shall be implemented by the Director in order to prevent the occurrence of ambient air pollutant concentrations which would cause significant harm to the health of persons. These concentrations are listed in the table at the end of this Section.

B. The following stages are identified by air quality criteria in order to provide for sequential emissions reductions, public notification and increased Department monitoring and forecast responsibilities. The declaration of any stage, and the area of the State affected, shall be based on air quality measurements and meteorological analysis and forecast. The procedures and actions required for each stage are described in the current edition of the Department's Manual entitled "Procedures for Prevention of Emergency Episodes".

1. STAGE I – ALERT. An air pollution alert shall be declared when any of the alert level concentrations listed in the table at the end of this Section are exceeded at any monitoring site and when meteorological conditions indicate that there will be a continuance or recurrence of alert level concentrations for the same pollutant(s) during the subsequent 24-hour period. If, 48 hours after an alert has been initially declared, air pollution concentrations and meteorological conditions do not improve, the warning stage control actions shall be implemented but no warning shall be declared, unless air quality has deteriorated to the extent described in B.2. below.

2. STAGE II – WARNING. An air pollution warning shall be declared when any of the warning level concentrations listed in the table at the end of this Section are exceeded at any monitoring site and when meteorological conditions indicate that there will be a continuance or recurrence of concentrations of the

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same pollutant(s) exceeding the warning level during the subsequent 24-hour period. If, 48 hours after a warning has been initially declared, air pollution concentrations and meteorological conditions do not improve, the emergency stage shall be declared and its control actions implemented.

3. STAGE III – EMERGENCY. An air pollution emergency shall be declared when any of the emergency level concentrations listed in the table at the end of this Section are exceeded at any monitoring site and when meteorological conditions indicate that there will be a continuance or recurrence of concentrations of the same pollutant(s) exceeding the emergency level during the subsequent 24-hour period.

4. Summary of emergency episode and significant harm levels

Pollutant	Averaging Time	Alert	Warning	Emergency	Significant Harm
Carbon monoxide	1-hr	–	–	–	144
	4-hr	–	–	–	86.3
	8-hr	17	34	46	57.5
Nitrogen dioxide	1-hr	1,130	2,260	3,000	3,750
	24-hr	282	565	750	938
Ozone	1-hr	.2	.4	.5	.6
Particulates	24-hr	375	625	875	1,000
Sulfur dioxide	24-hr	800	1,600	2,100	2,620
Sulfur dioxide and particules combined	24-hr	65,000	261,000	393,000	490,000

Note: Units are ug/m^3 except for carbon monoxide which has units of mg/m^3 sulfur dioxide and particulates combined which has units of $(ug/m^3)^2$, and ozone, which has units of parts per million (ppm).

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Editorial correction, Subsection B. Paragraph 2. (Supp. 80-1). Editorial correction, Subsection A. (Supp. 80-2). Former Section R9-3-219 repealed, new Section R9-3-219 adopted eff. May 28, 1982 (Supp. 82-3). Former Section R9-3-219 renumbered without change as Section R18-2-219 (Supp. 87-3).

ARTICLE 3. PERMITS

R18-2-301. Installation permits: general

A. No person shall commence construction of a new major or minor source or any stationary source that will emit 5 or more tons of lead per year, or the major alteration of a source or the construction or modification of air pollution control equipment, or alteration of a point source that emits 5 or more tons of lead per year without first obtaining an installation permit from the Director.

B. There shall be three classes of installation permits:

1. Class A permits shall be issued to persons proposing to commence construction of a new major source or make a major alteration to a major source, or the construction or alteration of a stationary source emitting 5 or more tons of lead per year.

2. Class B permits shall be issued to persons proposing solely to commence construction or an alteration of any air pollution control equipment.

3. Class C permits shall be issued to persons proposing to commence construction of or make a modification to a minor source. Minor sources which do not have the potential to emit any uncontrolled pollutant at greater than or equal to an emissions rate defined herein as "significant" shall not require an installation permit, except that, stationary rotating machinery of greater than 325 brake horsepower and fuel burning equipment or incinerators that are fired at a sustained rate of more than 500,000 Btu per hour for more than an eight-hour period shall require installation permits as herein specified.

C. No Class A installation permit shall be issued to a person proposing to commence construction of a new major source or make a major alteration to a major source unless one of the following conditions is met:

1. A new major source or major alteration to a major source that is classified as a major source under this Chapter and not because the source has controlled emissions of 100 or 250 tons per year (as applicable) of any single pollutant regulated under this Chapter, shall meet the following requirements:

a. The source or alteration shall comply with the general Class A installation permit requirements in Subsection D.;

b. The source or alteration shall comply with the installation permit application requirements in Subsection E.

c. The source or alteration shall comply with the more stringent of the applicable new source performance standards in Article 8 or the existing source performance standards in Article 5; or,

2. A new stationary source or alteration to a stationary source that emits 5 or more tons of lead per year, and not regulated under Paragraph 1. above shall meet the following requirements:

a. The source or alteration shall comply with all applicable provisions of Sections R18-2-302 through R18-2-305.

b. The source or alteration shall comply with the general Class A installation permit requirements of Subsection D.

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c. The source or alteration shall comply with the installation permit application requirements of Subsection E.

D. No Class A installation permit shall be issued to a person unless that person can demonstrate to the Director that:

1. The new major source or major alteration will be in compliance with whatever emission limitation, design, equipment, work practice or operational standard, or combination thereof is applicable to the source or alteration.

a. The degree of emission limitation required for control of any pollutant under this Article shall not be affected in any manner by:

i. So much of the stack height of any source as exceeds good engineering practice, or,

ii. Any other dispersion technique.

b. Subparagraph D.1.a. of this Section shall not apply with respect to stack heights in existence before December 31, 1970, or to dispersion techniques implemented before then.

2. The new major source or major alteration will not exceed the applicable standards for hazardous air pollutants contained in Article 9.

3. The new major source or major alteration will not exceed the limitations, if applicable, on emission from nonpoint sources contained in Article 4.

4. A stationary source that will emit 5 or more tons of lead per year will not violate the ambient air quality standards for lead as contained in Section R18-2-207.

E. An application for a Class A installation permit shall be made on forms prescribed by the Director, and shall be signed by the applicant. An application shall contain, at a minimum, the information required by Appendix 1. In addition, the application shall contain such information or data as is necessary to demonstrate compliance with Subsection C. of this Section.

F. Except for assessing air quality impacts within Class I areas, the air impact analysis required to be conducted in connection with the filing for a Class A installation permit shall initially consider only the geographical area located within a fifty (50) kilometer radius from the new major source or major alteration's point of greatest emissions. The Director (on his own initiative or upon receipt of written notice from any person) shall have the right at any time to request an enlargement of the geographical area for which an air quality impact analysis is to be performed by giving the person applying for the installation permit written notice thereof, specifying the enlarged radius to be so considered. In performing an air impact analysis for any geographical area with a radius of more than fifty (50) kilometers, the person applying for the installation permit may use monitoring or modeling data obtained from major sources having comparable emissions or having emissions which are capable of being accurately used in such demonstration, and which are subjected to terrain and atmospheric stability conditions which are comparable or which may be extrapolated with reasonable accuracy for use in such demonstration.

APPENDIX J

LOCOMOTIVE RULE

ARTICLE 6. EMISSIONS FROM MOBILE ~~POINT~~ SOURCES

(NEW AND EXISTING)

R18-2-601. ~~General~~ Classification of mobile sources

A. This Article is applicable to mobile sources which either move while emitting air contaminants or are frequently moved during the course of their utilization, but are not classified as motor vehicles, agricultural vehicles, or agricultural equipment used in normal farm operations.

B. Unless otherwise specified, no mobile source shall emit smoke or dust the opacity of which exceeds 40 percent.

R18-2-602. Off-road machinery

~~A. Off-road machinery shall include trucks (such as mining trucks), graders, scrapers, rollers, and other construction and mining machinery not normally driven on a completed public roadway.~~

~~B.~~ A. ~~Notwithstanding the provisions of R18-2-601, no~~ No person shall cause, ~~suffer,~~ allow or permit to be emitted into the atmosphere from any off-road machinery, smoke for any period greater than ten consecutive seconds, the opacity of which exceeds 40 percent. Visible emissions when starting cold equipment shall be exempt from this requirement for the first ten minutes.

B. Off-road machinery shall include trucks, graders, scrapers, rollers, locomotives and other construction and mining machinery not normally driven on a completed public roadway.

R18-2-603. Heater-planer units

No person shall cause, ~~suffer,~~ allow or permit to be emitted into the atmosphere~~,~~ from any heater-planer operated for the purpose of reconstructing asphalt pavements, smoke the opacity of which

APPENDIX K

ASARCO's GLOVER LEAD SIP

ASARCO

Technical Services Center
M.O. Varner
Director
D.E. Hoff
Engineering Manager
D.A. Robbins
Environmental Business Manager
M.B. King
Research Manager

Asarco - Glover, Missouri Lead SIP Modeling
Drossing Fugitive Lead Emission Reductions

Since the Radian report of 1981, to determine if the Asarco Glover lead smelter met Reasonably Available Control Technology (RACT), improvements have been made in capturing fugitive lead emissions from the drossing area. The improvements have resulted in a 28% reduction in the fugitive lead emission rate of 1985, from 18.6 to 13.3 #/day. The reductions have not been credited to the Glover emission inventory, and should be considered in the Future Case lead modeling.

Drossing Emission Distribution

		1982			Control		1985
Fuming Lead Pot	: 5%	x 32.4	=	1.6	x (1 - 0%)	=	1.6
Pouring Operation	:40%	x 32.4	=	13.0	x (1 - 0%)	=	13.0
Cooling of Pot	: 5%	x 32.4	=	1.6	x (1 - 0%)	=	1.6
Dross Removal	:50%	x 32.4	=	16.2	x (1 - 85%)	=	2.4
				32.4 #/dy			18.6 #/dy

Improvements Since 1985

(1) Bayonet coupling installed on drossing hood connection to ventilation system.

(2) Replaced butterfly damper in blast furnace / drossing ventilation system with a guillotine damper to prevent leakage.

(3) A general tightening of the ventilation system.

(4) Reinstatement of the original dross hood design, which provided better fugitive fume capture.

Control Efficiency Improvement

According to Radain's report of 1985, a hood face velocity of 200 - 500 fpm would be required to capture lead fumes released from the ladle during pouring operations. For the old hood design, the flow can be approximated by:

$$Q = V(2X^2)$$

Where: Q is the volumetric flow rate (afm).
V is the desired capture velocity (fpm).
X is the distance from the source to the middle of the suction point (see Figure 1).

Assumption:

(1) A face velocity of 200 fpm is the minimum required to capture fugitive lead fumes during pouring operations.

(2) A face velocity of 500 fpm results in a 100% capture efficiency of fugitive lead emissions during pouring operations.

(3) Old hood design, used in 1985 is still in operation.

Dressing Ventilation in 1985

Flow Rate at Dross Kettles #1 5,900 ACFM
#2 4,300 ACFM
5,100 ACFM Average

Face Velocity at hood entrance: 235 fpm.

Dressing Ventilation in 1987

Flow Rate at Dross Kettles #1 7,081 ACFM
#2 7,689 ACFM
7,385 ACFM Average

Face Velocity at hood entrance:

$$V_{'87} = V_{'85} (Q_{'87} / Q_{'85}) = 340 \text{ fpm}$$

Approximately a 45% improvement since 1985.

JOHN ASHCROFT
Governor

FREDERICK A. BRUNNER
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation, and Historic Preservation

MEMORANDUM

DATE: June 2, 1987

TO: Iron County File - ASARCO

FROM: Tom Scheppers

SUBJECT: Inspection of Dross Kettle Ventilation Improvements - Relating to 1987 Lead SIP Revision

On May 28, 1987, Nick Nikkila requested that I inspect improvements made on the drossing kettle ventilation system to determine if the improvements resulted in a 40% reduction of emissions during the pouring operation of a lead pot as claimed by ASARCO in a memo dated May 17, 1987 by Todd Federuk (portion attached). This 40% reduction would result in a 28% overall reduction of the total drossing fugitive emissions from 1985. The 40% figure was established based on a 40% increase of the drossing kettle ventilation rate measured by ASARCO in 1984 and 1987. Yesterday Calvin Ku, Technical Support Section, and I went to the ASARCO facility located at Glover, Missouri to inspect modifications performed on the drossing kettles ventilation system.

ASARCO controls the lead emissions by use of a central ventilation system from the #1 and #2 drossing/receiving kettles and the tapping operations from Blast Furnaces 1 and 2, which includes the lead and slag launders from Furnaces Number 1 and 2, the filling of the lead pot at each furnace, and the pouring of the lead pot of lead from the furnace to the receiving kettles. The ventilation system consists of one fan pulling ambient air across each emission point mentioned above and routing the emissions to a baghouse. Valves are installed in the ductwork to close off unneeded portions of the ductwork during non-operation of certain emission points. Since only one furnace can be operated at a time, there is a main valve in the ductwork at each furnace to shut off unnecessary air flow from a shutdown furnace and its associated emission points. A valve is also installed at each of the two receiving kettles since only one kettle receives lead at a time. The ductwork to the unused kettle is closed off by the use of a butterfly valve. The valve in the ductwork to the #1 furnace operations was previously a butterfly valve that did not seal sufficiently. Therefore, ASARCO has replaced the butterfly valve with a guillotine damper, thereby reducing leaks to a near minumum. The butterfly valve installed on the ductwork for Furnace #2 is opened since Furnace #2 is still in operation. Replacement of the butterfly valve on Furnace #2, while in operation, would result in no controls for the tapping area during the replacement project. Therefore, the installation of the guillotine damper will be performed after Furnace #2 is shut down. This is anticipated to take place sometime before the end of 1987.

Furthermore, no reduction in emissions would result if the butterfly valve was replaced prior to a startup of Furnace #1. As long as the Number 2 furnace is in operation, the butterfly valve or guillotine damper would open. There would be no need to insure a tight shutoff of the valve.

The removable drossing kettle hood, when placed on a dross kettle, previously had a flange connection for the ventilation ductwork to seal with the permanent fixed ductwork. This flange required proper alignment and downward pressure on the mating flange in order to insure a proper seal. Due to the massiveness of the dross kettle hood, the movement of the kettle with an overhead crane, a buildup of material on the dross kettle upper surface, and the need for proper alignment within ¼", the flange could not provide an optimum seal. Therefore, a bayonet coupling was installed on both drossing kettles #1 and #2. This coupling allowed two points to pivot in the connection, resulting in good sealing without an exact alignment. The bayonet coupling consists of a large flange on the fixed ductwork next to the kettle floor and a smaller upper flange on the ventilation hood. A tapered cone rests from the upper flange and extends to seal around the lower flange. Kettle #2 had a hood installed on it at the time of inspection and, in looking at the coupling, I could see a gap in some areas ranging from a quarter inch to no more than a half inch along three inches of one side of the lower and upper flanges. This is an improved seal compared to the previous mating flanges.

Inspection doors located along the ventilation system ductwork were sealed to reduce or stop the air leakage into the ventilation system, therefore, allowing a greater flow at the collection points. I inspected the ductwork below the drossing kettle floor and could not see or hear any leaks at any inspection doors or connecting flanges for the ductwork.

The original dross hood design was in use. During the Radian inspection in 1984, a new design dross hood was used on an experimental basis. At that time, the new design did not appear to improve the collection of emissions during pouring. ASARCO did conclude that the original design had a better capture efficiency.

In addition to the improvements stated in the ASARCO memo, Calvin and I were informed of the installation of an axial flow fan on the ventilation system at kettle #2. At this time, the fan is started by an operator immediately prior to a pour. The fan runs for a three minute period and then automatically shuts off. The fan could not be run continuously due to the sizing of the baghouse handling the ventilation system. A three minute duration is adequate during pouring and should not present a problem for the existing baghouse. Another fan has been received for installation in the ductwork for kettle #1. Installation should be completed in no more than two weeks.

A high priority upon arriving at the plant was to observe the pouring of lead pot into the receiving kettle, since lead is poured approximately every half hour to 45 minutes. Calvin and I observed two pours. The first pour consisted of raising the ventilation cover from the lead pot,

removing the full lead pot from the furnace tapping area, transfer of the lead pot by overhead crane to the receiving kettle area, hooking an empty chain to the pot to allow the crane operator to tilt the pot, transfering the pot to the kettle hood opening, tilting the pot to pour lead, returning the pot to upright position, lowering the pot to be sprayed by an employee with water for cooling, returning the pot to furnace tapping area, and lowering the ventilation hood over the lead pot at the blast furnace area. It took some time for the emissions to be captured by the hood as the pot was tilted into a pouring position. During the tilting, it appeared that half of the emissions from the pot were being collected by the hood and the other half escaping from the hood toward the top of the building. As the pot fully tilts to pour, the crane operator can move the pot completely against the opening on the hood, thereby reducing the open area to a minimum. There were no visible emissions during the pour at the time the pot was completely tilted against the hood. During the first pour we observed, after the pot is emptied, the crane operator moves the pot to a position so that an operator can spray water into the pot, cooling the remaining molten lead in order to reduce further fuming of the lead pot and prolong the life of the refractory lining inside the pot. The cooling step was necessary due to the physical properties of the refractory not able to withstand the continuous heat. ASARCO is now using a better refractory that does not require a cooling period between refills. After spraying the interior of the lead pot, the crane operator replaces the pot at the furnace tapping area to refill with lead from the furnace.

Cooling the interior of the lead pot by the use of water may result in lower emissions by cooling the lead inside the pot to a point not to cause fuming, or it may result in an increase in overall lead emissions due to two reasons: 1) The atmosphere within the lead pot is probably saturated with lead vapors. The lead fumes would be emitted as a breathing loss from the semi-enclosed pot. By introducing water into the pot, the atmosphere inside the pot is purged with steam, thereby replacing the saturated lead vapor with saturated stream. 2) The emissions from the lead pot are uncontrolled during movement of the pot by overhead crane. By elimination of the cooling step with water, the lead pot is replaced under controls at the furnace in less time.

The second pouring that we observed was done without water cooling of the lead pot. By elimination of the cooling step, the fuming pot is replaced at the furnace in less time. I timed different portions of the pouring process for informational purposes. It took 75 seconds from the time that the pot was removed from the ventilation controls at the furnace until it is in place at the kettle hood and pouring began. During the next 20 seconds, while pouring, emissions were partially escaping from the hood (approximately half). During the next 18 seconds of the pour, while the pot is nearly fully tilted, there were no visible emissions. Then the pot was removed from the kettle and carried back to the furnace in 93 seconds. An additional 22 seconds was needed to lower the collection hood at the furnace into place so that the fuming pot emissions were back to fully controlled.

At this point, I am unsure if a linear relationship can be established between the flowrate in the ventilation system from the dressing kettle

hood and the capture efficiency of lead fumes from the lead pot. I am also unsure if Radian's assumption of a face velocity of 500 fpm would result in a 90% capture efficiency. I can, however, make an estimation of further reductions of lead emissions during the pouring operations based on visible emissions during this and previous inspections.

I have separated the pouring time into two steps: The first step is the initial tilting of the pot and pouring of the lead (20 seconds), and the second step is the final tilting of the pot and positioning the pot into the opening of the hood to improve the seal of the opening (18 seconds of no visible emissions).

From previous observations prior to the improvements, I would assume that the drossing kettle ventilation systems captured approximately 35% of the visible lead emissions during the first 20 seconds of pouring and 30% during the next 18 seconds of pouring.

Under the present case observed yesterday, I would estimate 50% capture during the first 20 seconds of pouring and 90% capture during the next 18 seconds. This would be a 50% reduction in lead emissions during the pour. (See attached Table 1)

Therefore, the emissions resulting from the pouring operation would be:

Pouring Contributions		Drossing Fugitives		1987 Improvements		1987 Pouring Emission Rate
40%	X	32.4 #/day	X	50%	=	6.5 #/day

The 1987 pouring emission rate shown above is my recommendation based on my estimates from visible emission observations and previous estimates made in previous years for the related contributions from different components totalling the drossing fugitives. The pouring emission rate is subject to change as test data or further information is obtained that may support a more representative emissions estimation.

TABLE 1 - EMISSIONS REDUCTION ESTIMATE

	First Half of Pour	Second Half of Pour	Total of Pouring Operation
Pour Time (seconds)	20	18	38
1985 Emissions (lb/day)	(20/38) X 13.0 6.84	(18/38) X 13.0 6.16	(18/38) X 13.0 13.0
Assumed Control Efficiency	35%	50%	
Emissions-uncontrolled	6.84/.65 10.52	6.16/.5 12.32	22.84
1987 Assumed Control Efficiency	50%	90%	
Emissions (lb/day)	(1-.5) X 10.52 5.26	(1-.9) X 12.32 1.23	6.49

Emissions Reductions for Pouring Operations(%) from 1985 to 1987

$$\frac{\text{Emissions}_{1984} - \text{Emissions}_{1987}}{\text{Emissions}_{1984}} \times 100 =$$

$$\frac{13.0 - 6.49}{13.0} \times 100 = 50\%$$

Assumptions:

1) 1985 emissions from the pouring operations is 13.0 lb/day.

2) No visible emissions result in 90% capture efficiency.

APPENDIX L

ASARCO's LETTER REGARDING PREVENTION OF OFF-ROAD VEHICLE ACTIVITIES

RAY UNIT
RICHARD W. BANGHART
GENERAL MANAGER
OWEN D. MILLER
CONTROLLER

October 20, 1988

Mayor Virginia A. Darby
Town of Hayden
520 Velasco Avenue
Post Office Box "B"
Hayden, Arizona 85235

Dear Mayor Darby:

Recreational Traffic on ASARCO Property

At a July 8, 1988 meeting before the Hayden Town Council, it came to our attention that your Police Department believes that efforts to apprehend and prosecute nuisance traffic on ASARCO property have been hampered by ASARCO's lack of support for their efforts. Please let me assure you that ASARCO is committed to assist the Hayden Police Department in any way necessary to prevent trespassing by motorbikes, ATV's and other vehicles on ASARCO property.

This sort of traffic is an important contributor to the dust problem in the Hayden area. Although ASARCO has done its best to physically prevent access to its property, we have not been and cannot be completely successful. Your police officers have our permission to pursue and apprehend unauthorized traffic on plant property, and have our commitment to prosecute offenders. We would, of course, appreciate our security forces being notified either before or during the Hayden's Police Department's apprehending efforts, but realize that timely communication is not always possible. However, I am sure that the best efforts of all concerned will prevail.

Yours sincerely,

R. W. Banghart

RWB/sf

ASARCO INCORPORATED RAY UNIT
P.O. BOX 8 HAYDEN, AZ 85235 (602) 356-7811

G. The application for a Class B installation permit shall be made on forms prescribed by the Director, and shall be signed by the applicant. An application shall contain, at a minimum, the information required by Appendix 1.

H. No Class C installation permit shall be issued to a person proposing to commence construction of a minor source unless that person can demonstrate that the source:

1. Will not violate the standards of performance contained in Articles 5 or 6 of this Chapter, or Article 8 in A.A.C. Title 9, Chapter 3. Where more than one standard of performance is appliable to a minor source, the more stringent standard shall apply.

2. Will not violate the visible emission standards of R18-2-501.

3. Will not violate the nonpoint source emission standards of Article 4 of these Rules.

I. Upon receipt of an application, the Director shall make a preliminary determination whether the permit should be approved or disapproved and whether, if approved, conditions should be attached to such approval.

J. The Director shall make available in at least one location in each air quality control region in which the proposed major source or major alteration (or the proposed construction or alteration of a stationary source emitting 5 or more tons of lead per year) would be constructed, a copy of all materials submitted with an application for a Class A installation permit, a copy of the preliminary determination, a brief summary of the basis for the preliminary determination, and, to the maximum extent practicable, a copy or summary of all other materials to be considered in making a final determination on the application.

K. The Director shall notify the public within five days of receipt of an application for a Class A installation permit, by advertisement in a newspaper of general circulation in each air quality control region in which the proposed major source or major alteration would be constructed, of the application. Such notification shall include a summary of the application, the Director's preliminary determination, the degree of increment consumption expected from operation of the new major source or major alteration, and a statement informing the public of the opportunity for written comment and the time frame, which shall not be less than thirty days, within which comments are to be submitted.

L. A copy of the notice required by Subsection K. shall be sent to the permit applicant, to the Administrator, and to the officials and agencies having cognizance over the location where the proposed major source or major alteration would occur.

M. Within twenty days after receipt of an application for a Class A installation permit, or any addition to such application, the Director shall advise the applicant of any deficiency in the application or in the information submitted. In the event of such a deficiency, the date of receipt of the application shall be, for the purpose of this Section, the date on which the Director received all required information.

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N. The Director may require the applicant to provide additional information or to provide and maintain such facilities or perform such air impact modeling procedures as are necessary to secure information that will disclose the nature, extent, quantity or effects of air contaminants discharged into the atmosphere from the major source or facility described in the application.

O. The Director shall take final action on the application within thirty days of the proper filing of the completed application. The Director shall notify the applicant in writing of his approval or denial. Such notification shall be made available for public inspection in at least one location in the air quality control region in which the major source is located.

P. An installation permit shall remain in effect until the operating permit for such major source is granted, the operating permit for a major source is amended to reflect the installation of air pollution control equipment, or the installation permit is cancelled.

Q. The Director may cancel an installation permit issued under this Section if the proposed construction or major alteration is not begun within 18 months of issuance, or if during the construction or major alteration, work is suspended for more than 18 months.

Historical Note

Amended eff. Aug. 7, 1975 (Supp. 75-1). Amended as an emergency eff. Dec. 15, 1975 (Supp. 75-2). Amended eff. May 10, 1976 (Supp. 76-3). Amended eff. Apr. 12, 1977 (Supp. 77-2). Amended eff. Mar. 24, 1978 (Supp. 78-2). Former Section R9-3-301 repealed, new Section R9-3-301 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. July 9, 1980 (Supp. 80-4). Amended eff. May 28, 1982 (Supp. 82-3). Amended Subsections B. and C. eff. Sept. 22, 1983 (Supp. 83-5). Amended Subsection B. Paragraph 3. eff. Sept. 28, 1984 (Supp. 84-5). Former Section R9-3-301 renumbered without change as Section R18-2-301 (Supp. 87-3).

R18-2-302. Installation permits for sources located in nonattainment areas

A. Except as provided in Subsections C. through I. below, no Class A installation permit shall be issued to a person proposing to construct a new major source or make a major alteration to a source located in any nonattainment area for the pollutant(s) for which the source is classified as a major source or the alteration is classified as a major alteration unless:

1. The person demonstrates that the new major source or the major alteration will meet an emission limitation which is the lowest achievable emission rate (LAER) for that source for that specific pollutant(s).

2. The person certifies that all existing major sources owned or operated by that person (or any entity controlling, controlled by, or under common control with that person) in the State are in compliance with all conditions contained in the operating or conditional permits of each of the sources and all other applicable emission limitations and standards under the Clean Air Act.

3. The person demonstrates that emission reductions for the specific pollutant(s) from source(s) in existence in the allowable offset area of the new

major source or major alteration (whether or not under the same ownership) meet the offset and net air quality benefit requirements of R18-2-303.

B. No Class A installation permit shall be issued to a person proposing to construct a new major source for volatile organic compounds or carbon monoxide (or both) or make a major alteration for volatile organic compounds or carbon monoxide (or both) to a major source located in a nonattainment area for photochemical oxidants or carbon monoxide (or both) unless:

1. The person performs an analysis of alternative sites, sizes, production processes and environmental control techniques for such new major source or major alteration; and

2. The Director determines that the analysis demonstrates that the benefits of the new major source or major alteration outweigh the environmental and social costs imposed as a result of its location, construction or alteration.

C. At such time that a particular source or modification becomes a major stationary source or major modification solely by virtue of a relaxation in any enforceable limitation which was established after August 7, 1980, on the capacity of the source or modification otherwise to emit a pollutant, such as restriction on hours of operation, then the requirements of this Section shall apply to the source or modification as though construction had not yet commenced on the source or modification.

D. Secondary emissions shall not be considered in determining a new source or modification's potential to emit and therefore whether the new source or modification is major. However, if a new source or modification is subject to this Section on the basis of its direct emissions, permit to construct the new source or modification shall be denied unless the conditions specified in Paragraphs 1. and 2. of Subsection A. of this Section are met for reasonably quantifiable secondary emissions caused by the new source or modification.

E. A permit to construct a new source or modification shall be denied unless the conditions specified in Paragraphs 1., 2., and 3. of Subsection A. of this Section are met for fugitive emissions caused by the new source or modification. However, these conditions shall not apply to a new major source or major alteration that would be a major source or major alteration only if fugitive emissions, to the extent quantifiable, are considered in calculating the potential emissions of the source or alteration, and the source is not either among the Categorical Sources listed in R18-2-101 or belongs to the category of sources for which New Source Performance Standards under A.A.C. Title 9, Chapter 3, Article 8 or Hazardous Air Pollutant Standards under A.A.C. Title 9, Chapter 3, Article 9 were adopted prior to August 7, 1980.

F. The requirements of this Section shall not apply to a new major source or major alteration to a major source if an application for an installation permit for the new source or alteration was received before May 15, 1982. In such a case the new major source or major alteration shall be subject to the requirements contained in its installation permit and the regulations in effect on the date on which the permit was issued.

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G. The requirements of A.3. of this Section shall not apply to temporary emission sources, such as pilot plants and portable sources, which are only temporarily located in the nonattainment area, are otherwise regulated by an installation or operating permit, and are in compliance with the conditions of that permit.

H. The requirements of A.3. of this Section shall not apply to emissions of a pollutant from a new major source or major alteration to be located in a nonattainment area for that pollutant, if the person applying for an installation permit under this Section can demonstrate that emissions of that pollutant from the new major source or major alteration will not exceed the allowance plan adopted pursuant to Sections 172 and 173 of the Act.

I. The requirements of A.3. of this Section shall not apply to new resource recovery projects burning municipal solid waste and sources which must switch fuels due to lack of adequate fuel supplies or where a source is required to be modified as a result of EPA regulations, if the owner or operator of the source or alteration can demonstrate that:

1. He made his best efforts to meet the requirements of A.3. and such efforts were unsuccessful; and

2. All available emission offsets have been or will be secured; and

3. He will continue to seek offsets and apply them when they become available.

Historical Note

Amended eff. Aug. 7, 1975 (Supp. 75-1); Former Section R9-3-302 repealed, new Section R9-3-302 adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-302 repealed, new Section R9-3-302 adopted eff. Oct. 2, 1979 (Supp. 79-5). Former Section R9-3-302 repealed, new Section R9-3-302 adopted eff. May 28, 1982 (Supp. 82-3). Former Section R9-3-302 renumbered without change as Section R18-2-302 (Supp. 87-3).

R18-2-303. Offset and net air quality benefit standards

A. Increased emissions by a new major source or a major alteration subject to this Section must be offset by reductions in the emission of each pollutant for which the area has been designated as nonattainment and for which the source is classified as a major source or the alteration of the source is classified as a major alteration. Such offset may be obtained by reductions in emissions from the major source or major alteration or from any other source (including but not limited to nonmajor stationary sources, mobile sources, non-point sources and major sources) in existence or projected, on the startup date of the new major source or major alteration, to be located in the allowable offset area.

1. Credit for an emissions offset can be used only if it has not been relied upon in demonstrating attainment or reasonable further progress, and if it has not been relied upon previously in issuing a permit pursuant to Sections R18-2-301 and R18-2-302.

B. An offset will not be sufficient unless total emissions for the particular pollutant for which the offset is required in the allowable offset area after the

new major source or major alteration commences operation will be less than the baseline of the total emissions for that pollutant and such reductions are sufficient to satisfy the Director that emissions from the new major source or major alteration together with the offset will result in reasonable further progress for that pollutant in the allowable offset area.

1. Only intrapollutant emission offsets shall be allowed. Intrapollutant emission offsets for ozone (or photochemical oxidants) and nitrogen dioxide shall include offset reductions in emissions of volatile organic compounds and oxides of nitrogen, respectively.

C. For purposes of this Section, "reasonable further progress" shall mean annual incremental reductions in emissions of the applicable air pollutant which are sufficient in the judgment of the Director to provide for attainment of the applicable air quality standards by the date required under Section 172 of the Act. Reasonable further progress shall be deemed to occur if the offset reductions are sufficient to satisfy the Director that the construction of the new major source or major alteration together with the offset will result in a net air quality benefit.

1. For purposes of this Section, "net air quality benefit" shall mean that during similar time periods either a. or b. below, is applicable:

a. A reduction in the number of violations of the applicable Arizona ambient air quality standard within the allowable offset area has occurred and the following mathematical expression is satisfied:

$$\sum_{i=1}^{N} \frac{x_i - C}{N} \leq \sum_{j=1}^{K} \frac{x_j - C}{K}$$

where:

C = The applicable Arizona ambient air quality standard

x_i = The concentration level of the violation at the ith receptor for such pollutant after offsets.

N = The number of violations for such pollutant after offsets ($N \leq K$).

x_j = The concentration level of the violation at the jth receptor from such pollutant before offsets.

k = The number of violations for such pollutant before offsets.

b. The average of the ambient concentrations within the allowable offset area following the implementation of the contemplated offsets will be less than the average of the ambient concentrations within the allowable offset area without the offsets.

D. Baseline further defined:

1. For the purpose of this Section, the baseline of total emissions from any sources in existence or sources which have obtained an installation permit (regardless of whether or not such sources are in actual operation at the time of

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filing of the Class A installation permit application for any particular pollutant) will be the total emissions allowed by the regulatory emission limitations in effect at the time the application is filed. In addition, the baseline of total emissions will consist of all emission limitations included as conditions on Federally enforceable permits except that the offset baseline shall be the actual emissions of the source from which offset credit is obtained where:

a. No emission limitations are applicable to a source from which offsets are being sought; or

b. The demonstration of reasonable further progress and attainment of ambient air quality standards is based upon the actual emissions of sources located within a designated nonattainment area.

2. Where the emission limitations for a particular pollutant allow greater emissions than the potential emission rate of the source for that pollutant, the baseline shall be the potential emission rate at the time the permit application is filed and emissions offset credit shall be allowed only for control below the potential emission rate.

E. For an existing fuel combustion source, offset credit shall be based on the allowable emissions under the regulations or permit conditions applicable to the source for the type of fuel being burned at the time the installation permit application is filed. If an existing source commits to switch to a cleaner fuel at some future date, emissions offset credit based on the allowable (or actual) emissions for the fuels involved shall not be acceptable unless:

1. The source's operating permit specifically requires the use of a specified alternative control measure which would achieve the same degree of emissions reduction should the source switch back to a dirtier fuel at some later date; and,

2. The source demonstrates to the satisfaction of the Director that it has secured an adequate long-term supply of the cleaner fuel.

F. Offsets shall be made on either a pounds-per-hour, pounds-per-day, or tons-per-year basis, whichever is applicable, when all facilities involved in the emission offset calculations are operating at their maximum expected or allowed production rate and, exeept as otherwise provided in Subsection E. of this Section, utilizing the type of fuel burned at the time the permit application is filed. A tons-per-year basis shall not be used if the new or modified source or the source of the offsets is not expected to operate throughout the entire year. No emissions credit may be allowed for replacing one hydrocarbon compound with another of lesser reactivity, except for Methane, Ethane, 111 - Trichloroethane (Methyl Chloroform), and Trichlorotrifluoroethane (Freon 113).

G. Emissions reductions achieved by shutting down an existing source or permanently curtailing production or operating hours below baseline levels may be credited, provided that the work force to be affected has been notified of the proposed shutdown or curtailment. Source shutdowns and curtailments in production or operating hours occurring prior to the date the new major source or major alteration application is filed generally may not be used for emissions

offset credit. However, where an applicant can establish that it shut down or curtailed production after August 7, 1977, or less than one year prior to the date of permit application, whichever is earlier, and the proposed new major source or major alteration is a replacement for the shutdown or curtailment, credit for such shutdown or curtailment may be applied to offset emissions from the new source or alteration.

H. The allowable offset area shall refer to the geographical area in which are located the sources whose emissions are being sought for purposes of offsetting emissions from a new major source or major alteration. For the pollutants sulfur dioxide, particulate and carbon monoxide, the allowable offset area shall be any area in which Arizona ambient air quality standards for such pollutants are violated and in which the significance levels described in R18-2-101 are exceeded due to the emissions from such new major source or major alteration. The area shall be determined by atmospheric dispersion modeling. If the emission offsets are obtained from a source on the same premises or in the immediate vicinity of the new major source or major alteration, and the pollutants disperse from substantially the same effective stack height, atmospheric dispersion modeling shall not be required. The allowable offset area for all other pollutants shall be the nonattainment areas for those pollutants within which the new major source or major alteration is to be located and those portions of attainment areas located within 50 kilometers of such nonattainment areas.

I. An emission reduction may only be used to offset emissions if the reduced level of emissions will continue for the life of the new source or alteration and if the reduced level of emissions is legally enforceable. It will be considered legally enforceable if the following conditions are met:

1. The emission reduction is included as a condition in the operating permit of the source relied upon to offset the emissions from the new major source or major alteration, or in the case of reductions from sources controlled by the applicant, is included as a condition of the installation permit for the new major source or major alteration, or is adopted as a part of these Rules or comparable rules and regulations of any other governmental entity or is contractually enforceable by the Department;

2. The permit conditions or regulations containing the emission reduction have been submitted to the Administrator for inclusion in the State Implementation Plan adopted pursuant to Section 110 of the Act.

Historical Note

Amended eff. Aug. 7, 1975 (Supp. 75-1). Amended eff. Aug. 6, 1976 (Supp. 76-4). Former Section R9-3-303 repealed, new Section R9-3-303 adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-303 repealed, new Section R9-3-303 adopted eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. May 28, 1982 (Supp. 82-3). Amended Subsection D. Paragraph 1. eff. Sept. 28, 1984 (Supp. 84-5). Former Section R9-3-303 renumbered without change as Section R18-2-303 (Supp. 87-3).

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R18-2-304. Installation permit requirements for sources located in attainment and unclassifiable areas

A. Except as provided in Subsections B. through G. below and R18-2-307, Innovative control technology, no Class A installation permit shall be issued to a person proposing to construct a new major source or make a major alteration to a major source (or to construct or modify a stationary source that emits 5 or more tons of lead per year) that would be constructed in an area designated as attainment or unclassifiable for any pollutant and for which construction commenced after May 15, 1982 unless the source or alteration meets the following conditions:

1. A new major source shall apply best available control technology for each pollutant subject to regulation under this Chapter that it would have the potential to emit in significant amounts.

2. A major alteration shall apply best available control technology for each pollutant subject to regulation under this Chapter for which the alteration would result in a significant net emissions increase at the source. This requirement applies to each proposed emissions unit at which a net emissions increase in the pollutant would occur as a result of a physical change or change in the method of operation in the unit.

3. For phased construction projects, the determination of best available control technology shall be reviewed and modified as appropriate at the latest reasonable time which occurs no later than 18 months prior to commencement of construction of each independent phase of the project. At such time the owner or operator of the applicable stationary source may be required to demonstrate the adequacy of any previous determination of best available control technology for the source.

4. The person applying for the permit performs an air impact analysis and monitoring as specified in R18-2-305 and such analysis demonstrates that allowable emission increases from the proposed new major source or major alteration, in conjunction with all other applicable emission increases or reductions (including secondary emissions):

a. Would not cause or contribute to air pollution in violation of any applicable maximum allowable increase over the baseline concentration in R18-2-217.B. for any attainment or unclassified area; or

b. Would not contribute to an increase in ambient concentrations for a pollutant by an amount in excess of the significance level for such pollutant in any area in which Arizona primary or secondary ambient air quality standards for that pollutant are being violated. A new major source of volatile organic compounds or a major alteration to a major source of volatile organic compounds will be presumed to contribute to violations of the Arizona ambient air quality standards for ozone if it will be located within fifty (50) kilometers of a nonattainment area for ozone. The presumption may be rebutted for a new major source or major alteration if it can be satisfactorily demonstrated to the Director that emissions of volatile organic compounds from the new major

source or major alteration will not contribute to violations of the Arizona ambient air quality standards for ozone in adjacent nonattainment areas for ozone. Such a demonstration shall include a showing that topographical, meteorological or other physical factors in the vicinity of the new major source or major alteration are such that transport of volatile organic compounds emitted from the source are not expected to contribute to violations of the ozone standards in the adjacent nonattainment areas.

5. Air quality models:

a. All estimates of ambient concentrations required under this Section shall be based on the applicable air quality models, data basis, and other requirements specified in the "Guideline on Air Quality Models" (OAQPS 1.2-080, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, April 1978).

b. Where an air quality impact model specified in the "Guideline on Air Quality Models" is inappropriate, the model may be modified or another model substituted. Such a change must be subject to notice and opportunity for public comment. Written approval of the EPA Administrator must be obtained for any modification or substitution. Methods like those outlined in the "Workbook for the Comparison of Air Quality Models" (U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, May 1978) should be used to determine the comparability of air quality models.

B. The requirements of this Section shall not apply to a new major source or major alteration to a major source if an installation permit for the new source or alteration was received before May 15, 1982. In such a case the new major source or major alteration shall be subject to the requirements contained in its installation permit and the regulations in effect on the date on which the permit was issued.

C. The requirements of this Section shall not apply to a new major source or major alteration to a source with respect to a particular pollutant if the person applying for the permit demonstrates that, as to that pollutant, the source or alteration is located in an area designated as nonattainment for the pollutant.

D. The requirements of this Section shall not apply to a new major source or major alteration to a source when the owner of such source is a nonprofit health or educational institution.

E. The requirements of this Section shall not apply to a new major source or major alteration of a source if such source or alteration would be a major source or major alteration only if fugitive emissions, to the extent quantifiable, are considered in calculating the potential emissions of the source or alteration, and the source is not either among the Categorical Sources listed in R18-2-101 or belongs to the category of sources for which New Source Performance Standards under A.A.C. Title 9, Chapter 3, Article 8 or Hazardous Air Pollutant Standards under A.A.C. Title 9, Chapter 3, Article 9 were adopted prior to August 7, 1980.

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F. The requirements of this Section shall not apply to a new major source which is classified as a major source solely because the source is capable of generating more than a total of seventy-five tons per day of air pollutants regulated under this Chapter and not because the source has potential emissions of 100 or 250 tons per year (as applicable) of any single pollutant regulated under this Chapter

G. The requirements of this Section shall not apply to a portable source which would otherwise be a new major source or major alteration to an existing source if such portable source is under an installation or operating permit issued under this Chapter, is in compliance with the conditions of that permit, and the emissions from the source will not impact a Class I area nor an area where an applicable increment is known to be violated.

H. Special rules applicable to Federal Land Managers:

1. Notwithstanding any other provision of this Section, a Federal Land Manager may present to the Director a demonstration that the emissions attributed to such new major source or major alteration to a source will have significant adverse impact on visibility or other specifically defined air quality related values of any Federal Mandatory Class I area designated in R18-2-217.A.2. regardless of the fact that the change in air quality resulting from emissions attributable to such new major source or major alteration to a source in existence will not cause or contribute to concentrations which exceed the maximum allowable increases for a Class I area. If the Director concurs with such demonstrations, the permit shall be denied.

2. If the owner or operator of a proposed new major source or a source for which major alteration is proposed demonstrates to the Federal Land Manager that the emissions attributable to such major source or major alteration will have no significant adverse impact on the visibility or other specifically defined air quality related values of such areas and the Federal Land Manager so certifies to the Director, the Director may issue a permit notwithstanding the fact that the change in air quality resulting from emissions attributable to such new major source or major alteration will cause or contribute to concentrations which exceed the maximum allowable increases for a Class I area. Such a permit shall require that such new major source or major alteration comply with such emission limitations as may be necessary to assure that emissions will not cause increases in ambient concentrations greater than the following maximum allowable increases over baseline concentrations for such pollutants:

	Maximum Allowable Increase (Micrograms per cubic meter)
Sulfur Oxide	
Period of exposure	
Low terrain areas:	
24-hour maximum	36
3-hour maximum	130
High terrain areas:	
24-hour maximum	62
3-hour maximum	221

Historical Note

Amended eff. Aug. 7, 1975 (Supp. 75-1). Former Section R9-3-304 repealed, new Section R9-3-304 formerly Section R9-3-305 renumbered and amended eff. Aug. 6, 1976 (Supp. 76-4). Former Section R9-3-304 repealed, new Section R9-3-304 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Former Section R9-3-304 repealed, new Section R9-3-304 adopted eff. May 28, 1982 (Supp. 82-3). Former Section R9-3-304 renumbered without change as Section R18-2-304 (Supp. 87-3).

R18-2-305. Air quality impact analysis and monitoring requirements

A. Any application for an installation permit to construct a new major source or major alteration to a major source shall contain an analysis of ambient air quality in the area that the new major source or major alteration would affect for each of the following pollutants:

1. For the new source, each pollutant that it would have the potential to emit in a significant amount;

2. For the alteration, each pollutant for which it would result in a significant net emissions increase.

B. With respect to any such pollutant for which no Arizona ambient air quality standard exists, the analysis shall contain shall air quality monitoring data as the Director determines is necessary to assess ambient air quality for that pollutant in any area that the emissions of the pollutant would affect.

C. With respect to any such pollutant (other than nonmethane hydrocarbons) for which such a standard does exist, the analysis shall contain continuous air quality monitoring data gathered for purposes of determining whether emissions of that pollutant would cause or contribute to a violation of the standard or any maximum allowable increase.

D. In general, the continuous air quality monitoring data that is required shall have been gathered over a period of at least one year and shall represent at least the year preceding receipt of the application, except that, if the Director determines that a complete and adequate analysis can be accomplished with monitoring data gathered over a period shorter than one year (but not to be less than four months), the data that is required shall have been gathered over at least that shorter period.

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E. For any application which becomes complete, except as to the requirements of Subsection C., prior to February 9, 1982, the data that Subsection C. requires shall have been gathered over at least the period from February 9, 1981, to the date the application becomes otherwise complete, except that:

1. If the new source or alteration would have been major for that pollutant under R18-2-304 as in effect on October 2, 1979, any monitoring data shall have been gathered over at least the period required by those regulations.

2. If the Director determines that a complete and adequate analysis can be accomplished with monitoring data over a shorter period (not to be less than four months), the data that Subsection C. requires shall have been gathered over that shorter period.

3. If the monitoring data would relate exclusively to ozone and would not have been required under R18-2-304 as in effect on October 2, 1979, the Director may waive the otherwise applicable requirements of this Subsection to the extent that the applicant shows that the monitoring data would be unrepresentative of air quality over the full year.

F. The owner or operator of a proposed stationary source or modification to a source of volatile organic compounds who satisfies all conditions of 40 CFR 51, Appendix S. Section IV, may provide post-approval monitoring data for ozone in lieu of providing preconstruction data as required under Subsection B., C., and D., above.

G. Post-construction monitoring. The owner or operator of a new major source or major alteration shall, after construction of the source or alteration, conduct such ambient monitoring as the Director determines is necessary to determine the effect emissions from the new source or alteration may have, or are having, on air quality in any area.

H. Operations of monitoring stations. The owner operator of a new major source or major alteration shall meet the requirements of 40 CFR 58, Appendix B, during the operation of monitoring stations for purposes of satisfying Subsections B. through G. above.

I. The requirements of Subsections B. through H., above shall not apply to a new major source or major alteration to an existing source with respect to monitoring for a particular pollutant if:

1. The emissions increase of the pollutant from the new source or the net emissions increase of the pollutant from the alteration would cause, in any area, air quality impacts less than the following amounts:

Carbon monoxide — 575 ug/m^3, 8-hour average;
Nitrogen dioxide — 14 ug/m^3, annual average;
Total suspended particulate — 10 ug/m^3, 24-hour average;
Sulfur dioxide — 13 ug/m^3, 24-hour average;
Lead — 0.1 ug/m^3, 24-hour average;
Mercury — 0.25 ug/m^3, 24-hour average;
Beryllium — 0.0005 ug/m^3, 24-hour average;
Fluorides — 0.25 ug/m^3, 24-hour average;

Vinyl chloride – 1.5 ug/m^3, 24-hour average;
Total reduced sulfur – 10 ug/m^3, 1-hour average;
Hydrogen sulfide – 0.04 ug/m^3, 1-hour average;
Reduced sulfur compounds – 10 ug/m^3, 1-hour average;
Ozone – increased emissions of less than 100 tons per year of volatile organic compounds; or,

2. The concentrations of the pollutant in the area that the new source or alteration would affect are less than the concentrations listed in Paragraph 1. above.

J. Any application for an installation permit to construct a new major source or major alteration to a source shall contain:

1. An analysis of the impairment to visibility, soils and vegetation that would occur as a result of the new source or alteration and general commercial, residential, industrial and other growth associated with the new source or alteration. The applicant need not provide an analysis of the impact on vegetation having no significant commercial or recreational value.

2. An analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial and other growth associated with the new source or alteration.

Historical Note

Amended eff. Aug. 7, 1975 (Supp. 75-1). Amended as an emergency eff. Dec. 15, 1975 (Supp. 75-2). Amended eff. May 10, 1976 (Supp. 76-3). Former Section R9-3-306 renumbered as Section R9-3-305 eff. Aug. 6, 1976. References changed to conform (Supp. 76-4). Amended eff. Apr. 12, 1977 (Supp. 77-2). Amended eff. Mar. 24, 1978 (Supp. 78-2). Former Section R9-3-305 repealed, new Section R9-3-305 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Former Section R9-3-305 repealed, new Section R9-3-305 adopted eff. May 28, 1982 (Supp. 82-3). Former Section R9-3-305 renumbered without change as R18-2-305 (Supp. 87-3).

R18-2-306. Operating permits

A. Except as provided in this Section or R18-2-1101 (Jurisdiction and Authority), no person shall operate any major or minor source or other stationary source that emits 5 or more tons of lead per year without first obtaining an operating permit from the Director. When an installation permit is required to commence construction of a new major source or major alteration of an existing major source or construction or major alteration of a source capable of emitting 5 or more tons of lead per year an operating permit shall not be issued to the new major source or for the major alteration until such time as the installation permit has been obtained. In the event a person operating any major source or other stationary source capable of emitting 5 or more tons of lead per year, unintentionally commences construction or major alteration activities for which an installation permit is required pursuant to Chapter 2 without obtaining such installation permit, such person shall be required to present to the Director all necessary information which is required to be submitted by an applicant for an

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installation permit and the new major source or major alteration (or other stationary source capable of emitting 5 or more tons of lead per year) shall be made to conform to all applicable standards.

No operating permit need be issued to any minor source which does not have the potential to emit any uncontrolled pollutant at greater than or equal to an emissions rate defined herein as "significant" and no such permit need be issued to any stationary rotating machinery operated at less than or equal to 325 brake horsepower, nor to any fuel burning equipment or incinerator that is not fired at a sustained rate of greater than 500,000 Btu per hour for an 8-hour period.

B. No operating permit will be issued unless:

1. The applicant demonstrates that the source will be in compliance with all applicable requirements of this Chapter.

2. For any major source operating in a nonattainment area for any pollutant(s) for which the source is classified as a major source, the owner or operator demonstrates compliance with reasonably available control technology.

3. The person applying for an operating permit demonstrates that the major or minor source or major alteration will not emit pollutants in excess of the applicable hazardous air pollutant standards contained in A.A.C. Title 9, Chapter 3, Article 9 (Hazardous Air Pollutant Standards).

4. The person applying for an operating permit demonstrates that the major or minor source or major alteration will not emit pollutants in excess of the applicable emission limitation for nonpoint sources contained in Article 4.

C. Applications for operating permit:

1. An application for an operating permit shall be made on forms furnished by the Director.

2. A separate application is required for each major or minor source.

3. Each application shall be signed by the applicant.

4. Each application for an initial operating permit shall be accompanied by plans, descriptions, specifications and drawings showing the design of the source or major alteration, stack data, and the nature and amount of emissions. An application for a renewal of an operating permit shall be accompanied by plans, descriptions, specifications and drawings showing any changes in the source's configuration from that which existed on the date of issuance of the most recent operating permit.

5. Each application shall include information concerning compliance with any conditions on any prior permit.

6. The application shall include such information as is required by Appendix 2 and such other information as the Director or applicable provisions of these Rules shall prescribe.

7. The Director may waive the submission by the applicant of any of the data or information required by this Section if he shall deem such data to be inappropriate or unnecessary.

D. Within twenty days after the receipt of an application, the Director shall advise the applicant of any additional information or testing required. No

application shall be considered complete and properly filed until the applicant has submitted such information or test results.

E. The Director may require the applicant to provide additional information or to provide and maintain such ambient air monitoring facilities or ambient air impact modeling as necessary to secure information that will disclose the effect emissions from the major source will have on maintenance and attainment of ambient air quality standards. An item of equipment not covered by an operating permit may be operated for purposes of testing, including accomplishment of new source performance testing under A.A.C. Title 9, Chapter 3, Article 8, only if specific written permission has been obtained from the Director designating the dates of such operation for testing.

F. The Director shall take final action on the application within thirty days of the proper filing of the completed application. The Director shall notify the applicant in writing of his approval, conditional approval or denial. Such notification shall be made available for public inspection in at least one location in the air quality control region in which the major source is located.

G. Each operating permit issued under these Rules shall include the following provisions:

1. A description of the facility and equipment covered and its location, or for a mobile source, the area in which it may operate.
2. The name and address of the owner or operator of the source.
3. The date the permit is issued and the date it will expire.
4. The terms and conditions specified in R18-2-308.

H. The issuance of an operating permit shall not relieve the owner or operator from compliance with any local, State or Federal law or regulations, nor does any other law, regulation or permit relieve the owner or operator from obtaining a permit required under this Chapter.

I. Any owner or operator who fails to obtain an operating permit required by this Chapter, or who fails to comply with a permit as approved and conditioned by the Director, shall be subject to enforcement action under the provisions of A.R.S. §§ 36-1709 (Order of Abatement), 36-1715 (Injunctive Relief), and 36-1720 (Misdemeanor).

J. Operating permits issued pursuant to this Section shall be issued for a period of one year except that operating permits in the form of primary nonferrous smelter orders authorized under Section 119 of the Act as amended may be issued for the periods provided for therein.

Historical Note

Adopted eff. Aug. 7, 1975 (Supp. 75-1). Former Section R9-3-307 renumbered as Section R9-3-306 eff. Aug. 6, 1976. Reference changed to conform (Supp. 76-4). Former Section R9-3-306 repealed, new Section R9-3-306 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Amended eff. July 9, 1980 (Supp. 80-4). Amended Subsection A. eff. May 28, 1982 (Supp. 82-3). Amended Subsection A. eff. Sept. 28, 1984 (Supp. 84-5). Former Section R9-3-306 renumbered without change as R18-2-306 (Supp. 87-3).

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R18-2-307. Innovative control technology

A. Notwithstanding the provisions of R18-2-304.A.1., R18-2-304.A.2., and R18-2-304.A.3. the owner or operator of a proposed new major source or major alteration may request that the Director approve a system of innovative control technology rather than the best available control technology requirements otherwise applicable to the new source or alteration.

B. The Director shall approve the installation of a system of innovative control technology if the following conditions are met:

1. The owner or operator of the proposed source or alteration satisfactorily demonstrates that the proposed control system would not cause or contribute to an unreasonable risk to public health, welfare, or safety in its operation or function;

2. The owner or operator agrees to achieve a level of continuous emissions reduction equivalent to that which would have been required under R18-2-304.A.2. by a date specified in the source's installation permit. Such date shall not be later than four years from the time of start-up or seven years from permit issuance;

3. The source or alteration would meet requirements equivalent to those in R18-2-304.A. based on the emissions rate that the stationary source employing the system of innovative control technology would be required to meet on the date specified in the installation permit.

4. Before the date specified in the installation permit, the source or alteration would not:

a. Cause or contribute to any violation of an applicable State ambient air quality standard; or,

b. Impact any portion of any Class I area; or

c. Impact any portion of any other area where an applicable ambient incremental standard is known to be violated in that portion.

5. All other applicable requirements, including those for public participation contained in R18-2-301.I. through R18-2-301.Q., have been met.

C. The Director shall withdraw any approval to employ a system of innovative control technology made under this Section if:

1. The proposed system fails by the specified date to achieve the required continuous emissions reduction rate; or,

2. The proposed system fails before the specified date is so as to contibute to an unreasonable risk to public health, welfare, or safety; or,

3. The Director decides at any time that the proposed system is unlikely to achieve the required level of control or to protect the public health, welfare, or safety.

D. If the new source or major alteration fails to meet the required level of continuous emissions reduction within the specified time period, or if the approval is withdrawn in accordance with Subsection C. above, the Director may allow the owner or operator of the source or alteration up to an additional three

years to meet the requirement for the application of best available control technology through use of a demonstrated system of control.

Historical Note

Adopted eff. Aug. 7, 1975 (Supp. 75-1). Former Section R9-3-307 renumbered as Section R9-3-306 eff. Aug. 6, 1976 (Supp. 76-4). New Section R9-3-307 adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Former Section R9-3-307 repealed, new Section R9-3-307 adopted eff. May 28, 1982 (Supp. 82-3). Amended B.4.b. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-307 renumbered without change as R18-2-307 (Supp. 87-3).

R18-2-308. Permit conditions

An installation or operating permit shall contain such terms and conditions as the Director deems necessary to assure a source's compliance with the requirements of Article 1, Chapter 14 of Title 36 of the Arizona Revised Statutes and the provisions of this Chapter. The Director may include, but is not limited to permit conditions which require:

1. Compliance with emission limitations.
2. Compliance with design, equipment, work practice or operations standards if emission limitations are not feasible.
3. Recordkeeping and reporting. Such requirements shall be consistent with the provisions of A.R.S. § 36-1708.
4. Ambient air quality monitoring.
5. Emissions monitoring.
6. Notification to the Director of such events as the commencement of construction, initial startup and performance testing.
7. Preventive maintenance of air pollution control equipment.
8. Maintenance and calibration of ambient air quality and emissions monitoring equipment.

Historical Note

Adopted eff. Aug. 7, 1975 (Supp. 75-1). Former Section R9-3-308 repealed, new Section R9-3-308 adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-308 renumbered without change as R18-2-308 (Supp. 87-3).

R18-2-309. Excess emissions

A. Emissions in excess of an applicable emission limitation contained in these Rules or in the terms of an installation, operating, or conditional permit shall constitute a violation. However, further enforcement action will not be taken if the owner or operator of the facility has complied with the reporting requirements of R18-2-314 in a timely manner, and has demonstrated to the Director's satisfaction that:

1. The excess emissions resulted from a sudden and unavoidable breakdown of the process or the control equipment; resulted from unavoidable conditions during startup or shutdown; resulted from unavoidable conditions during

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an upset of operations, or that greater or more extended excess emissions will result unless scheduled maintenance is performed.

2. The air pollution control equipment, process equipment, or processes were at all times maintained and operated, to the maximum extent practicable, in a manner consistent with good practice for minimizing emissions;

3. Where repairs were required, such repairs were made in an expeditious fashion when the person knew or should have known that applicable emission limitations were being exceeded. Off-shift labor and overtime were utilized where practical to insure that such repairs were made as expeditiously as possible. If off-shift labor and overtime were not utilized, the person satisfactorily demonstrated that such measures were impractical;

4. The amount and duration of the excess emissions (including any bypass operation) were minimized to the maximum extent practicable during periods of such emissions;

5. All feasible steps were taken to minimize the impact of the excess emissions on potential violations of ambient air quality standards;

6. The excess emissions are not part of a recurring pattern indicative of inadequate design, operation, or maintenance; and,

7. During the period of excess emissions there were no measured violations of the ambient air quality standards established in Article 2 of this Chapter which could be attributed to the emitting facility.

B. It shall be the burden of the owner or operator of the facility to demonstrate, through submission of the data and information required by this Rule, that all reasonable and practicable measures within his control were implemented to prevent the occurrence of excess emissions.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amendment filed Sept. 18, 1979, eff. following the adoption of Article 7. Nonferrous Smelter Orders. Amended eff. Oct. 2, 1979 (Supp. 79-5). Article 7. Nonferrous Smelter Orders adopted eff. Jan. 8, 1980. Amendment filed Sept. 18, 1979 eff. Jan. 8, 1980 (Supp. 80-2). Amended eff. Sept. 28, 1984 (Supp. 84-5). Former Section R9-3-309 renumbered without change as R18-2-309 (Supp. 87-3).

R18-2-310. Test methods and procedures

A. Except as otherwise specified in these Rules, the applicable testing procedures contained in the Department's *Arizona Testing Manual for Air Pollutant Emissions* (January 1, 1987 Edition), incorporated herein by reference and on file with the Office of the Secretary of State and the Department of Environmental Quality, shall be used to determine compliance with the standards established in this Chapter or contained in installation or operating permits issued pursuant to this Chapter.

B. The opacity of visible emissions shall be determined by Reference Method 9 of the *Arizona Testing Manual* in all cases.

C. The heat content of solid fuel shall be determined according to ASTM method D-3176-74, "ultimate analysis of coal or coke" and ASTM method D-2015, "gross calorific value of solid fuel by the adiabatic bomb calorimeter".

D. A variance from the approved test procedures in any test plan submitted for Department approval may be granted for the duration of that plan by the Director provided that:

1. The methodology or procedure to be substituted is substantially equivalent to the procedures established in Subsections A. and C. above.

2. Granting the variance will not adversely affect the public health, safety and welfare.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. June 19, 1981 (Supp. 81-3). Amended *Arizona Testing Manual for Air Pollutant Emissions*, eff. Sept. 22, 1983 (Supp. 83-5). Amended *Arizona Testing Manual for Air Pollutant Emissions*, as of Sept. 15, 1984, eff. Aug. 9, 1985 (Supp. 85-4). Amended eff. Sept. 28, 1984 (Supp. 84-5). Former Section R9-3-310 renumbered without change as R18-2-310 (Supp. 87-3). Amended eff. Feb. 26, 1988 (Supp. 88-1).

R18-2-311. Air quality models

A. Where the Director requires a person requesting an installation or operating permit under this Chapter to perform air quality impact modeling to obtain such permit, the modeling shall be performed in a manner consistent with the *Guideline on Air Quality Models* (hereinafter called the "Guideline") issued by the United States Environmental Protection Agency in April 1978.

B. Where the person requesting an installation or operating permit can demonstrate that an air quality impact model specified in the Guideline is inappropriate, the model may be modified or another model substituted. However, before such modification or substitution can occur the Director must make a written finding that:

1. No model in the Guideline is appropriate for a particular permit under consideration, or,

2. The data base required for the appropriate model in the Guideline is not available; and,

3. The model proposed as a substitute or modification is likely to produce results equal or superior to those obtained by models in the Guideline; and,

4. The model proposed as a substitute or modification has been approved by the Administrator.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. July 9, 1980 (Supp. 80-4). Amended eff. Sept. 28, 1984 (Supp. 84-5). Former Section R9-3-311 renumbered without change as R18-2-311 (Supp. 87-3).

(The next page is 54.1.)

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R18-2-312. Performance tests

A. Within 60 days after a source or facility subject to the installation and operating permit requirements of this Article has achieved the capability to operate at its maximum production rate on a sustained basis but no later than 180 days after initial start-up of such source or facility and at such other times as may be required by the Director, the owner or operator of such source or facility shall conduct performance tests and furnish the Director a written report of the results of the tests.

(The next page is 55.)

B. Performance tests shall be conducted and data reduced in accordance with the test method and procedures contained in the Arizona Testing Manual unless the Director:

1. Specifies or approves, in specific cases, the use of a reference method with minor changes in methodology,

2. Approves the use of an equivalent method,

3. Approves the use of an alternative method the results of which he has determined to be adequate for indicating whether a specific source is in compliance, or

4. Waives the requirement for performance tests because the owner or operator of a source has demonstrated by the other means to the Director's satisfaction that the source or facility is in compliance with the standard.

5. Nothing in this Section shall be construed to abrogate the Director's authority to require testing.

C. Performance tests shall be conducted under such conditions as the Director shall specify to the plant operator based on representative performance of the source or facility. The owner or operator shall make available to the Director such records as may be necessary to determine the conditions of the performance tests. Operations during periods of start-up, shutdown, and malfunction shall not constitute representative conditions of performance tests unless otherwise specified in the applicable standard.

D. The owner or operator of a permitted source shall provide the Director two weeks prior notice of the performance test to afford the Director the opportunity to have an observer present.

E. The owner or operator of a permitted source shall provide, or cause to be provided, performance testing facilities as follows:

1. Sampling ports adequate for test methods applicable to such facility.

2. Safe sampling platform(s).

3. Safe access to sampling platform(s).

4. Utilities for sampling and testing equipment.

F. Each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For the purpose of determining compliance with an applicable standard, the arithmetic mean of results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur in which one of the three runs must be discontinued because of forced shutdown, failure of an irreplacable portion of the sample train, extreme meteorological conditions, or other circumstances beyond the owner or operator's control, compliance may, upon the Director's approval, be determined using the arithmetic mean of the results of the two other runs.

G. Except as provided in Subsection H. compliance with the emission limits established in this Chapter or as prescribed in permits issued pursuant to this Chapter shall be determined only by the performance tests specified in this Section.

H. In addition to performance tests specified in this Section, compliance with specific emission limits may be determined by:

1. Opacity tests; and

2. Emission limit compliance tests specifically designated as such in the regulation establishing the emission limit to be complied with.

I. Nothing in this Section shall be so construed as to prevent the utilization of measurements from emissions monitoring devices or techniques not designated as performance tests as evidence of compliance with applicable good maintenance and operating requirements.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Sept. 28, 1984 (Supp. 84-5). Former Section R9-3-312 renumbered without change as R18-2-312 (Supp. 87-3).

R18-2-313. Existing source emission monitoring

A. Every source subject to an existing source performance standard as specified in this Chapter shall install, calibrate, operate, and maintain all monitoring equipment necessary for continuously monitoring the pollutants and other gases specified in this Section for the applicable source category.

1. Applicability.

a. Fossil fuel-fired steam generators as specified in C.1. of this Section, shall be monitored for opacity, nitrogen oxides emissions, sulfur dioxide emissions, and oxygen or carbon dioxide.

b. Fluid bed catalytic cracking unit catalyst regenerators, as specified in C.4. of this Section, shall be monitored for opacity.

c. Sulfuric acid plants, as specified in C.3. of this Section, shall be monitored for sulfur dioxide emissions.

d. Nitric acid plants, as specified in C.2. of this Section, shall be monitored for nitrogen oxides emissions.

2. Exemptions.

a. The provisions of this Section shall not apply to any source which is scheduled for retirement prior to August 29, 1982, provided that adequate evidence and guarantees are provided that clearly show that the source will cease operations prior to such date.

b. Emission monitoring shall not be required when the source of emissions is not operating.

3. Variations.

a. The Director may approve, on a case-by-case basis, alternative monitoring requirements different from the provisions of this Section if the installation of a continuous emission monitoring system cannot be implemented by a source due to physical plant limitations or extreme economic reasons. Alternative monitoring procedures will be specified by the Director on a case-by-case basis and must include as a minimum, annual manual stack tests for the pollutants

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identified for each type of source in this Section. Examples of such special cases include, but are not limited to, the following:

b. Alternative monitoring requirements may be prescribed when installation of a continuous monitoring system or monitoring device specified by this Section would not provide accurate determinations of emissions (e.g., condensed, uncombined water vapor may prevent an accurate determination of opacity using commercially available continuous monitoring systems).

c. Alternative monitoring requirements may be prescribed when the affected facility is infrequently operated (e.g., some affected facilities may operate less than one month per year).

d. Alternative monitoring requirements may be prescribed when the Director determines that the requirements of this Section would impose an extreme economic burden on the source owner or operator.

e. Alternative monitoring requirements may be prescribed when the Director determines that monitoring systems prescribed by this Section cannot be installed due to physical limitations at the facility.

4. Monitoring system malfunction: A temporary exemption from the monitoring and reporting requirements of this Section may be provided during any period of monitoring system malfunction, provided that the source owner or operator shows to the satisfaction of the Director that the malfunction was unavoidable and is being repaired as expeditiously as practicable.

B. Installation and performance testing required under this Section shall be completed and monitoring and recording shall commence within 18 months of the effective date of this Section.

C. Minimum monitoring requirements:

1. Fossil-fuel fired steam generators: Each fossil-fuel fired steam generator, except as provided in the following Subparagraphs, with an annual average capacity factor of greater than 30 percent, as reported to the Federal Power Commission for calendar year 1976, or as otherwise demonstrated to the Department by the owner or operator, shall conform with the following monitoring requirements when such facility is subject to an emission standard for the pollutant in question.

a. A continuous monitoring system for the measurement of opacity which meets the performance specifications of this Section shall be installed, calibrated, maintained, and operated in accordance with the procedures of this Section by the owner or operator of any such steam generator of greater than 250 million Btu per hour heat input except where:

i. Gaseous fuel is the only fuel burned, or

ii. Oil or a mixture of gas and oil are the only fuels burned and the source is able to comply with the applicable particulate matter and opacity Regulations without utilization of particulate matter collection equipment, and where the source has never been found to be in violation through any administrative or judicial proceedings, or accepted responsibility for any violation of any visible emission standard.

b. A continuous monitoring system for the measurement of sulfur dioxide which meets the performance specifications of this Section shall be installed, calibrated, using sulfur dioxide calibration gas mixtures or other gas mixtures approved by the Director, maintained and operated on any fossil-fuel fired steam generator of greater than 250 million Btu per hour heat input which has installed sulfur dioxide pollutant control equipment.

c. A continuous monitoring system for the measurement of nitrogen oxides which meets the performance specification of this Section shall be installed, calibrated, using nitric oxide calibration gas mixtures or other gas mixtures approved by the Director, maintained and operated on fossil-fuel fired steam generators of greater than 1000 million Btu per hour heat input when such facility is located in an air quality control region where the Director has specifically determined that a control strategy for nitrogen dioxide is necessary to attain the ambient air quality standard specified in R18-2-206, unless the source owner or operator demonstrates during source compliance tests as required by the Department that such a source emits nitrogen oxides at levels 30 percent or more below the emission standard within this Chapter.

d. A continuous monitoring system for the measurement of the percent oxygen or carbon dioxide which meets the performance specifications of this Section shall be installed, calibrated, operated, and maintained on fossil-fuel fired steam generators where measurements of oxygen or carbon dioxide in the flue gas are required to convert either sulfur dioxide or nitrogen oxides continuous emission monitoring data, or both, to units of the emission standard within this Chapter.

2. Nitric acid plants: Each nitric acid plant of greater than 300 tons per day production capacity, the production capacity being expressed as 100 percent acid located in an air quality control region where the Director has specifically determined that a control strategy for nitrogen dioxide is necessary to attain the ambient air quality standard specified in R18-2-206, shall install, calibrate, using nitrogen dioxide calibration gas mixtures, maintain, and operate a continuous monitoring system for the measurement of nitrogen oxides which meets the performance specifications of this Section for each nitric acid producing facility within such plant.

3. Sulfuric acid plants: Each sulfuric acid plant as defined in R18-2-101A., of greater than 300 tons per day production capacity, the production being expressed as 100 percent acid, shall install, calibrate, using sulfur dioxide calibration gas mixtures or other gas mixtures approved by the Director, maintain and operate a continuous monitoring system for the measurement of sulfur dioxide which meets the performance specifications of this Section for each sulfuric acid producing facility within such a plant.

4. Fluid bed catalytic cracking unit catalyst regenerators at petroleum refineries. Each catalyst regenerator for fluid bed catalytic cracking units of greater than 20,000 barrels per day fresh feed capacity shall install, calibrate, maintain and operate a continuous monitoring system for the measurement of

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opacity which meets the performance specifications of this Section for each regenerator within such refinery.

D. Minimum specifications: Owners or operators of monitoring equipment installed to comply with this Section, except as provided in D.2. below, shall demonstrate compliance with the following performance specifications.

1. The performance specifications set forth in Appendix B of 40 CFR 60 are incorporated herein by reference, and shall be used by the Director to determine acceptability of monitoring equipment installed pursuant to this Section. However where reference is made to the Administrator in Appendix B of 40 CFR 60, the term "Director" should be inserted for the purpose of this Section. Also, where reference is made to the "Reference Method" in Appendix B of 40 CFR 60, the Director may allow the use of either the State approved reference method or the Federally approved reference method as published in 40 CFR 60. The performance specifications to be used with each type of monitoring system are listed below.

a. Continuous monitoring systems for measuring opacity shall comply with performance specification 1.

b. Continuous monitoring systems for measuring nitrogen oxides shall comply with performance specification 2.

c. Continuous monitoring systems for measuring sulfur dioxide shall comply with performance specification 2

d. Continuous monitoring systems for measuring oxygen shall comply with performance specification 3.

e. Continuous monitoring systems for measuring carbon dioxide shall comply with performance specification 3.

2. Exemptions: Any source which has purchased an emission monitoring system(s) prior to September 11, 1974, may be granted an exemption by the Director from meeting such test procedures prescribed in D.1. above for a five-year period ending on August 29, 1982.

3. Calibration gases: Span and zero gases should be traceable to National Bureau of Standards reference gases whenever these reference gases are available. Every six months from date of manufacture, span and zero gases shall be reanalyzed by conducting triplicate analyses using the reference methods in Appendix A. Part 60, Chapter 1, Title 40, CFR as amended: For sulfur dioxide, use Reference Method 6; for nitrogen oxides, use Reference method 7; and for carbon dioxide or oxygen, use Reference Method 3. The gases may be analyzed at less frequent intervals if longer shelf lives are guaranteed by the manufacturer.

4. Cycling time: Time includes the total time required to sample, analyze and record an emission measurement.

a. Continuous monitoring systems for measuring opacity shall complete a minimum of one cycle of sampling and analyzing for each successive six-minute period.

b. Continuous monitoring systems for measuring oxides of nitrogen, carbon dioxide, oxygen, or sulfur dioxide shall complete a minimum of one cycle of

operation (sampling, analyzing, and date recording) for each successive 15-minute period.

5. Monitor location: All continuous monitoring systems or monitoring devices shall be installed such that representative measurements of emissions of process parameter (i.e., oxygen, or carbon dioxide) from the affected facility are obtained. Additional guidance for location of continuous monitoring systems to obtain representative samples are contained in the applicable performance specifications of Appendix B of 40 CFR 60.

6. Combined effluents: When the effluents from two or more affected facilities of similar design and operating characteristics are combined before being released to the atmosphere through more than one point, separate monitors shall be installed.

7. Zero and drift: Owners or operators of all continuous monitoring systems installed in accordance with the requirements of this Section shall record the zero and span drift in accordance with the method prescribed by the manufacturer's recommended zero and span check at least once daily, using calibration gases specified in Subsection C. as applicable, unless the manufacturer has recommended adjustments at shorter intervals, in which case such recommendations shall be followed; shall adjust the zero span whenever the 24-hour zero drift or 24-hour calibration drift limits of the applicable performance specifications in Appendix B of Part 60, Chapter 1, Title 40 CFR are exceeded; and shall adjust continuous monitoring systems referenced by D.2. of this Section whenever the 24-hour zero drift or 24-hour calibration drift exceed 10 percent of the emission standard.

8. Span: Instrument span should be approximately 200 percent of the expected instrument data display output corresponding to the emission standard for the source.

E. Minimum data requirement: The following Paragraphs set forth the minimum data reporting requirements for sources employing continuous monitoring equipment as specified in this Section. These periodic reports do not relieve the source operator from the reporting requirements of Section R18-2-314.

1. The owners or operators of facilities required to install continuous monitoring systems shall submit to the Director a written report of excess emissions for each calendar quarter and the nature and cause of the excess emissions, if known. The averaging period used for data reporting must correspond to the averaging period specified in the emission standard for the pollutant source category in question. The required report shall include, as a minimum, the data stipulated in this Subsection.

2. For opacity measurements, the summary shall consist of the magnitude in actual percent opacity of all six-minute opacity averages greater than any applicable standards for each hour of operation of the facility. Average values may be obtained by integration over the averaging period or by arithmetically averaging a minimum of four equally spaced, instantaneous opacity measurements per

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minute. Any time periods exempted shall be deleted before determining any averages in excess of opacity standards.

3. For gaseous measurements the summary shall consist of emission averages in the units of the applicable standard for each averaging period during which the applicable standard was exceeded.

4. The date and time identifying each period during which the continuous monitoring system was inoperative, except for zero and span checks and the nature of system repair or adjustment shall be reported. The Director may require proof of continuous monitoring system performance whenever system repairs or adjustments have been made.

5. When no excess emissions have occurred and the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be included in the report.

6. Owners or operators of affected facilities shall maintain a file of all information reported in the quarterly summaries, and all other data collected either by the continuous monitoring system or as necessary to convert monitoring data to the units of the applicable standard for a minimum of two years from the date of collection of such data or submission of such summaries.

F. Data reduction: Owners or operators of affected facilities shall use the following procedures for converting monitoring data to units of the standard where necessary.

1. For fossil-fuel fired steam generators the following procedures shall be used to convert gaseous emission monitoring data in parts per million to g/million cal (lb/million Btu) where necessary.

a. When the owner or operator of a fossil-fuel fired steam generator elects under C.1.d. of this Rule to measure oxygen in the flue gases, the measurements of the pollutant concentration and oxygen concentration shall each be on a consistent basis (wet or dry).

i. When measurements are on a wet basis, except where wet scrubbers are employed or where moisture is otherwise added to stack gases, the following conversion procedure shall be used:

$$E_Q = C_{ws}F_w\left(\frac{20.9}{20.9(1-B_{wa})-\%O_{2ws}}\right)$$

ii. When measurements are on a wet basis and the water vapor content of the stack gas is determined at least once every fifteen minutes the following conversion procedure shall be used:

$$E_Q = C_{ws}F\left(\frac{20.9}{20.9(1-B_{ws})-\%O_{2ws}}\right)$$

Note: This equation is approved in principle. Aproval for actual practice is contingent upon demonstrating the ability to accurately determine B_{ws} such that

any absolute error in B_{ws} will not cause an error of more than ± 1.5 percent in the term.

$$\left(\frac{20.9}{20.9(1-B_{ws})-\%O_{2ws}}\right)$$

iii. When measurements are on a dry basis, the following conversion procedure shall be used:

$$E_Q = CF\left[\frac{20.9}{20.9-\%O_{2ws}}\right]$$

b. When the owner or operator elects under C.1.d. of this Section to measure carbon dioxide in the flue gases, the measurement of the pollutant concentration and the carbon dioxide concentration shall each be on a consistent basis (wet or dry) and the following conversion procedure used;

$$E_Q = CF_c\left[\frac{100}{\%CO_2}\right]$$

c. The values used in the equations under F.1. above are derived as follows:

E_Q = pollutant emission, g/million cal (lb/million Btu)

C = pollutant concentration, g/dscm (lb/dscf), determined by multiplying the average concentration (ppm) for each hourly period by 4.16×10^{-5} M g/dscm per ppm (2.64×10^{-9} M lb/dscf per ppm) where M = pollutant molecular weight, g/g-mole (lb/lb-mole), M = 64 for sulfur dioxide and 46 for oxides of nitrogen.

C_{ws} = pollutant concentrations at stack conditions, g/wscm (lb/wscf), determined by multiplying the average concentration (ppm) for each one-hour period by 4.15×10^{-5} M g/wscm per ppm (2.59×10^{-5} M lb/wscf per ppm) where M = pollutant molecular weight, g/g mole (lb/lb mole). M = 64 for sulfur dioxide and 46 for nitrogen oxides.

$\%O_2, \%CO_2$ = Oxygen or carbon dioxide volume (expressed as percent) determined with equipment specified under D.1.d. of this Section.

F, F_c = A factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted (F), a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted (F_c), respectively. Values of F and F_c are given in § 60.45(f) of Part 60, Chapter 1, Title 40, Code of Federal Regulations.

F_w = A factor representing a ratio of the volume of wet flue gases generated to the caloric value of the fuel combusted. Values of F_w are given in Reference Method 19 of the Arizona Testing Manual.

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B_{wa} = Proportion by volume of water vapor in the ambient air. Approval may be given for determination of B_{wa} by on-site instrumental measurement provided that the absolute accuracy of the measurement technique can be demonstrated to be within ±0.7 percent water vapor. Estimation methods for B_{wa} are given in Reference Method 19 of the Arizona Testing Manual.

B_{ws} = Proportion by volume of water vapor in the stack gas.

2. For sulfuric acid plants as defined in R18-2-101 the owner or operator shall:

a. Establish a conversion factor three times daily according to the procedures of § 60.84(b) of Chapter 1, Title 40, Code of Federal Regulations;

b. Multiply the conversion factor by the average sulfur dioxide concentration in the flue gases to obtain average sulfur dioxide emissions in Kg/metric ton (lb/short ton); and

c. Report the average sulfur dioxide emission for each averaging period in excess of the applicable emission standard in the quarterly summary.

3. For nitric acid plants the owner or operator shall:

a. Establish a conversion factor according to the procedures of § 60.73(b) of Chapter 1, Title 40, Code of Federal Regulations;

b. Multiply the conversion factor by the average nitrogen oxides concentration in the flue gases to obtain the nitrogen oxides emissions in the units of the applicable standard;

c. Report the average nitrogen oxides emission for each averaging period in excess of applicable emission standard in the quarterly summary.

4. The Director may allow data reporting or reduction procedures varying from those set forth in this Section if the owner or operator of a source shows to the satisfaction of the Director that his procedures are at least as accurate as those in this Section. Such procedures may include but are not limited to the following:

a. Alternative procedures for computing emission averages that do not require integration of data (e.g., some facilities may demonstrate that the variability of their emissions is sufficiently small to allow accurate reduction of data based upon computing averages from equally spaced data points over the averaging period).

b. Alternative methods of converting pollutant concentration measurements to the units of the emission standards.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Editorial correction, Subsection C., Paragraph 1., Subparagraph d. (Supp 80-2). Amended eff. July 9, 1980 (Supp. 80-4). Former Section R9-3-313 renumbered without change as R18-2-313 (Supp. 87-3).

R18-2-314. Excess emissions reporting

A. The owner or operator of any source issued an installation, conditional or operating permit shall report to the Director or his designated representative

any emissions in excess of the limits established by this Chapter or the applicable installation or operating permit. Such report shall be in writing and shall be submitted within fifteen working days of the date on which the excess emissions occurred.

B. The excess emissions report shall contain the following information:

1. The identity of the stack and/or other emission points where the excess emissions occurred.

2. The magnitude of the excess emissions expressed in the units of the applicable emission limitation and the operating data and calculations used in determining the magnitude of the excess emissions.

3. The time and duration or expected duration of the excess emissions.

4. The identity of the equipment causing the excess emissions.

5. The nature and cause of such emissions.

6. If the excess emissions were the result of a malfunction, steps taken to remedy the malfunction and the steps taken or planned to prevent the recurrence of such malfunctions.

7. The steps that were or are being taken to limit the excess emissions. If the source's operating permit contains procedures governing source operation during periods of start-up or malfunction and the excess emissions resulted from start-up or malfunction, the report shall contain a list of the steps taken to comply with the permit procedures.

C. Information required to be submitted by this Rule shall be summarized and reported in writing to the Director in accordance with provisions contained in the applicable installation or operating permit issued pursuant to the requirements of this Chapter.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. July 9, 1980 (Supp. 80-4). Former Section R9-3-314 renumbered without change as R18-2-314 (Supp. 87-3).

R18-2-315. Posting of permit

A person who has been granted an operating permit shall firmly affix such permit, an approved facsimile of such permit, or other approved identification bearing the permit number upon such equipment for which the permit is issued in such a manner as to be clearly visible and accessible. In the event that such equipment is so constructed or operated that such permit cannot be so placed, the permit shall be mounted so as to be clearly visible in an accessible place within a reasonable distance of such equipment or maintained readily available at all times on the operating premises.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. July 9, 1980 (Supp. 80-4). Former Section R9-3-315 renumbered without change as R18-2-315 (Supp. 87-3).

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R18-2-316. Notice by building permit agencies

All agencies of the county or political subdivisions of the county that issue or grant building permits or approvals shall examine the plans and specifications submitted by an applicant for a permit or approval to determine if an air pollution installation permit will possibly be required under the provisions of the rules and regulations in this Chapter. If it appears possible that such installation permit will be required, the agency shall give written notice to such applicant to contact the Director and shall furnish a copy of such notice to the Director.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-316 renumbered without change as R18-2-316 (Supp. 87-3).

R18-2-317. Permit nontransferable; exception

A. An installation permit or an operating permit shall not be transferable, whether by operation of law or otherwise, either from one location to another, from one piece of equipment to another, or from one person to another.

B. This Rule shall not apply to mobile or portable machinery or equipment which is transferred from one location to another provided that the owner or operator of such equipment notifies the Director in writing of the transfer at least thirty days before the transfer. The notification required under this Subsection shall include:

1. A description of the equipment is to be transferred including the operating permit number for such equipment.
2. A description of the present location;
3. A description of the location to which the equipment is to be transferred, including the availability of all utilities, such as water and electricity, necessary for the proper operation of all control equipment;
4. The date on which the equipment is to be moved; and
5. The date on which operation of the equipment will begin at the new location.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-317 renumbered without change as R18-2-317 (Supp. 87-3).

R18-2-318. Denial or revocation of an installation or operating permit

A. The Director shall deny an installation or operating permit to a person applying for such permit if that person does not demonstrate that the source for which the permit is sought is so designed, controlled, or equipped with such air pollution control equipment that the source may be expected to comply with the provisions of Article 1, Chapter 14, Title 36 of the Arizona Revised Statutes, the provisions of the regulations in this Chapter or the provisions of its permit.

B. The Director may revoke an installation or operating permit issued pursuant to this Chapter if:

1. The Director has reasonable cause to believe that the permit was obtained by fraud or misrepresentation.

2. The person applying for the permit failed to disclose a material fact required by the permit application form or the regulation applicable to the permit, of which the applicant had or should have had knowledge at the time the application was submitted.

3. The terms and conditions of the permit have been or are being violated.

C. If the Director denies or revokes an operating permit under this Section, the notice of such denial or revocation shall be served on the applicant or permittee by certified mail, return receipt requested. The notice shall be a statement detailing the grounds for the action sought.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-318 renumbered without change as R18-2-318 (Supp. 87-3).

R18-2-319. Permit fees

A. Prior to issuance of an installation or operating permit or renewal of an operating permit for any source for which a permit is required under this Chapter, the applicant for the permit shall pay to the Director a fee in the amount set forth in Appendix 4.

B. The fee charged for an installation or operating permit shall be sufficient to cover:

1. The reasonable cost of reviewing and acting upon the application for the permit, and

2. The reasonable costs of implementing and enforcing the terms and conditions of the permit (not including any court costs or other costs associated with any enforcement action).

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-319 renumbered without change as R18-2-319 (Supp. 87-3).

R18-2-320. Reserved

R18-2-321. Operating permits containing the terms and conditions of primary nonferrous smelter orders (NSO) or Federal delayed compliance orders (DCO)

A. An operating permit containing the terms and conditions of either a DCO or NSO may be issued for a period of greater than one year corresponding to the life of the NSO or DCO. The Director may alter or amend the terms and conditions of an NSO or DCO operating permit as required for consistency with the Federal Clean Air Act, as amended.

B. The owner or operator of such a source shall be required to furnish the Director with a quarterly report of the status of the source and construction

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progress. Reporting by the owner of a source having an NSO or DCO shall conform as a minimum to Sections R18-2-703, R18-2-704, R18-2-705, and if applicable, R18-2-706. In addition, the Director shall receive copies of any reports to EPA under these orders. Certain additional reporting requirements and conditions may be specified by the Director in operating permits issued under this Section.

C. For the purpose of this Chapter, sources operating under a consent decree issued by a Federal court shall meet the same requirements as these with a DCO.

Historical Note

Adopted eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-321 renumbered without change as R18-2-321 (Supp. 87-3).

R18-2-322. Temporary conditional permits

Temporary conditional permits may be issued by the Director in accordance with A.R.S. § 36-1711.

Historical Note

Adopted eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-322 renumbered without change as R18-2-322 (Supp. 87-3).

R18-2-323. Stack height limitation

A. The limitations set forth herein shall not apply to stacks or dispersion techniques used by the owner or operator prior to December 31, 1970, for which the owner or operator had:

1. Begun, or caused to begin, a continuous program of physical on-site construction of the stack;

2. Entered into building agreements or contractual obligations, which could not be cancelled or modified without substantial loss to the owner or operator, to undertake a program of construction of the stack to be completed in a reasonable time; or

3. Coal fired steam electric generating units, subject to the provisions of Section 118 of the Federal Clean Air Act which commenced operation before July 1, 1975, with stacks constructed under a construction contract awarded before February 8, 1974.

B. The degree of emission limitation required of any source after the respective date given in Subsection A. above for control of any pollutant must not be affected by so much of any source's stack height that exceeds good engineering practice or by any other dispersion technique.

C. The good engineering practice (GEP) stack height for any source seeking credit because of plume impaction which results in concentrations in violation of national ambient air quality standards or applicable prevention of significant deterioration increments can be adjusted by determining the stack height necessary to predict the same maximum air pollutant concentration on

any elevated terrain feature as the maximum concentration associated with the emission limit which results from modelling the source using the GEP stack height as determined herein and assuming the elevated terrain features to be equal in elevation to the GEP stack height. If this adjusted GEP stack height is greater than stack height the source proposes to use, the source's emission limitation and air quality impact shall be determined using the proposed stack height and the actual terrain heights.

D. Before the State issues a permit to a source based on a good engineering practice stack height that exceeds the height allowed by Subparagraphs a. and b. of the GEP definition given herein, the State must notify the public of the availability of the demonstration study and must provide opportunity for public hearing on it.

Historical Note

Adopted eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-323 renumbered without change as R18-2-323 (Supp. 87-3).

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ARTICLE 4. EMISSIONS FROM EXISTING AND NEW NONPOINT SOURCES

R18-2-401. General

For purposes of this Article, any source of air contaminants which due to lack of an identifiable emission point or plume cannot be considered a point source, shall be classified as a nonpoint source. In applying this criteria, such items as air-curtain destructors, heater-planners, and conveyor transfer points shall be considered to have identifiable plumes. Any affected facility subject to regulation under Article 5 of this Chapter or A.A.C. Title 9, Chapter 3, Article 8, shall not be subject to regulation under this Article.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Former Section R9-3-401 renumbered without change as Section R18-2-401 (Supp. 87-3).

R18-2-402. Unlawful open burning

A. Notwithstanding the provisions of any other Rule in this Chapter, it is unlawful for any person to ignite, cause to be ignited, permit to be ignited, or suffer, allow or maintain any open outdoor fire.

B. "Open outdoor fire", as used in this Rule, means any combustion of combustible material of any type outdoors, in the open where the products of combustion are not directed through a flue. "Flue", as used in this Rule, means any duct or passage for air, gases or the like, such as a stack or chimney.

C. The following fires are excepted from the provisions of this Rule:

1. Fires used only for cooking of food or for providing warmth for human beings or for recreational purposes or the branding of animals or the use of orchard heaters for the purpose of frost protection in farming or nursery operations.

2. Any fire set or permitted by any public officer in the performance of official duty, if such fire is set or permission given for the purpose of weed abatement, the prevention of a fire hazard, or instruction in the methods of fighting fires.

3. Fires set by or permitted by the State entomologist or county agricultural agents of the county for the purpose of disease and pest prevention.

4. Fires set by or permitted by the Federal government or any of its departments, agencies or agents, the State or any of its agencies, departments or political subdivisions, for the purpose of watershed rehabilitation or control through vegetative manipulation.

D. Permission for the setting of any fire given by a public officer in the performance of official duty under Paragraphs 2., 3., or 4. of Subsection C., shall be given, in writing, and a copy of such written permission shall be transmitted immediately to the Director of the Department of Environmental Quality and the control officer, if any, of the county, district or region in which such fire is allowed. The setting of any such fire shall be constructed in a manner and at such

time as approved by the Director, unless doing so would defeat the purpose of the exemption.

E. The following fires may be excepted from the provisions of this Section when permitted in writing by the Director of the Department of Environmental Quality or the control officer of the county, district or region in which such fire is allowed:

1. Fires set for the disposal of dangerous materials where there is no safe alternative method of disposal.

a. "Dangerous material" is any substance or combination of substances which is able or likely to inflict bodily harm or property loss unless neutralized, consumed or otherwise disposed of in a controlled and safe manner.

b. Fires set for the disposal of dangerous materials shall be permitted only when there is no safe alternative method of disposal, and when the burning of such materials does not result in the emission of hazardous or toxic substances either directly or as a product of combustion in amounts which will endanger health or safety.

2. Open outdoor fires for the disposal of ordinary household trash in an approved waste burner in nonurban areas of less than 100 well spread out dwelling units per square mile where no refuse collection and disposal service is available.

a. An "approved waste burner" is an incinerator constructed of fire resistant material with a cover or screen which is closed when in use having openings in the sides or top no greater than one inch in diameter.

b. Open burning of the following materials is forbidden: Garbage resulting from the processing, storage, service or consumption of food; asphalt shingles; tar paper; plastic and rubber products (such as waste crankcase oil, transmission oil and oil filters); transformer oils; and hazardous material containers including those that contained inorganic pesticides, lead, cadmium, mercury, or arsenic compounds.

F. The Director of the Department of Environmental Quality or the air pollution control officer, if any, of the county, district, or region may delegate the authority for the issuance of allowable open burning permits to responsible local officers. Such permits shall contain conditions limiting the manner and the time of the setting of such fires as specified in the Arizona Guidelines for Open Burning and shall contain a provision that all burning be extinguished at the discretion of the Director or his authorized representative during periods of inadequate atmospheric smoke dispersion, periods of excessive visibility impairment which could adversely affect public safety, or periods when smoke is blown into populated areas so as to create a public nuisance.

1. Any local officer delegated the authority for issuance of open burning permits shall maintain a copy of all currently effective permits issued including a means of contacting the person authorized by the permit to set an open fire in the event that an order for extinguishing of open burning is issued.

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G. Nothing in this Rule is intended to permit any practice which is a violation of any statute, ordinance, rule or regulation.

Historical Note

Amended eff. Aug. 6, 1976 (Supp. 76-4). Former Section R9-3-402 repealed, new Section R9-3-402 adopted eff. May 14, 1979 (Supp. 79-1). Amended and adopted by reference *Open Burning Guidelines for Air Pollution Control* eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-402 renumbered without change as Section R18-2-402 (Supp. 87-3).

R18-2-403. Forestry management

A. All national parks and national forests having areas which extend into more than one county of the State of Arizona, as well all State parks and forests shall be under the jurisdiction of the Director in all matters relating to prescribed burning or slash disposal.

B. Each entity mentioned in Subsection A. shall comply with the following:

1. Each national park, State park, national forest or State forest hereinafter called forest will apply directly to the Bureau for an annual burning permit for all planned burning projects. Application will be made in the spring of the year, prior to June 1 for the ensuing fiscal year.

2. The application shall be in the form of a letter listing all projects. Enclosed with the letter will be copies of the Park Service or Forest Service approved burning plans for each planned project. A map of the burn and immediate surrounding area must accompany each plan.

3. The application and the Park Service or Forest Service plans will list the following:

a. Approximate date the project will start.
b. Location of project by sections, townships, or ranges.
c. Approximate elevation of project.
d. Aspect of any slopes.
e. Description of fuel to be burned.
f. Prescribed conditions for fire (e.g. time of day, fuel moisture, weather).

4. Each forest as part of the application will provide the Bureau with one emergency or 24-hour telephone number.

5. Each forest will notify the Bureau when a project planned starting date is later changed. Notification will be by telephone. Any other changes, such as fuel type, duration of burn or location, should be included in this notification.

6. The determination to allow burning will be made on a day-by-day basis. It is the responsibility of each park or forest to telephone the Bureau for such a determination. Large fires and those that continue during nighttime hours will require special forecasts made by the national weather service, the Department's meteorologist, or by the permittee if forecast procedures are approved by the Department. On site meteorological measurements by the permittee may be required as inputs to dispersion forecasts and smoke management during the burn.

7. Once each year, on or before December 31, the Forest Service or Parks Service shall submit to the Bureau a report outlining the progress of research

and development concerning the effects of forest burn programs on air quality. Such report shall include, where applicable, innovations in the management of prescribed burning using meteorological data, as well as special burning methods, or innovative equipment. Alternatives to burning shall also be considered. Research as to cost effectiveness of the various methods should also be included.

Historical Note

Former Section R9-3-403 repealed, new Section R9-3-403 adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-403 renumbered without change as Section R18-2-403 (Supp. 87-3).

R18-2-404. Open areas, dry washes or riverbeds

A. No person shall cause, suffer, allow, or permit a building or its appurtenances, or a building or subdivision site, or a driveway, or a parking area, or a vacant lot or sales lot, or an urban or suburban open area to be constructed, used, altered, repaired, demolished, cleared, or leveled, or the earth to be moved or excavated, without taking reasonable precautions to limit excessive amounts of particulate matter from becoming airborne. Dust and other types of air contaminants shall be kept to a minimum by good modern practices such as using an approved dust suppressant or adhesive soil stabilizer, paving, covering, landscaping, continuous wetting, detouring, barring access, or other acceptable means.

B. No person shall cause, suffer, allow, or permit a vacant lot, or an urban or suburban open area, to be driven over or used by motor vehicles, trucks, cars, cycles, bikes, or buggies, or by animals such as horses, without taking reasonable precautions to limit excessive amounts of particulates from becoming airborne. Dust shall be kept to a minimum by using an approved dust suppressant, or adhesive soil stabilizer, or by paving, or by barring access to the property, or by other acceptable means.

C. No person shall operate a motor vehicle for recreational purposes in a dry wash, riverbed or open area in such a way as to cause or contribute to visible dust emissions which then cross property lines into a residential, recreational, institutional educational, retail sales, hotel or business premises. For purposes of this Subsection "motor vehicles" shall include, but not be limited to trucks, cars, cycles, bikes, buggies and three-wheelers. Any person who violates the provisions of this Subsection shall be subject to prosecution under A.R.S. § 36-1720.

Historical Note

Former Section R9-3-404 repealed, new Section R9-3-404 adopted eff. May 14, 1979 (Supp. 79-1). Amended by adding Subsection C. eff. Sept. 22, 1983 (Supp. 83-5). Former Section R9-3-404 renumbered without change as Section R18-2-404 (Supp. 87-3).

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R18-2-405. Roadways and streets

A. No person shall cause, suffer, allow or permit the use, repair, construction or reconstruction of a roadway or alley without taking reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne. Dust and other particulates shall be kept to a minimum by employing temporary paving, dust suppressants, wetting down detouring or by other reasonable means.

B. No person shall cause, suffer, allow or permit transportation of materials likely to give rise to airborne dust without taking reasonable precautions, such as wetting, applying dust suppressants, or covering the load, to prevent particulate matter from becoming airborne. Earth or other material that is deposited by trucking or earth moving equipment shall be removed from paved streets by the person responsible for such deposits.

Historical Note

Former R9-3-405, Other industries, renumbered R9-3-406, new Section adopted eff. Sept. 17, 1975 (Supp. 75-1). Former Section R9-3-405 repealed, new Section R9-3-405 adopted eff. May 14,1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Former Section R9-3-405 renumbered without change as Section R18-2-405 (Supp. 87-3).

R18-2-406. Material handling

No person shall cause, suffer, allow or permit crushing, screening, handling, transporting or conveying of materials or other operations likely to result in significant amounts of airborne dust without taking reasonable precautions, such as the use of spray bars, wetting agents, dust suppressants, covering the load, and hoods to prevent excessive amounts of particulate matter from becoming airborne.

Historical Note

Former Section R9-3-405, renumbered eff. Sept. 17, 1975 (Supp. 75-1). Former Section R9-3-406 repealed, new Section R9-3-406 adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-406 renumbered without change as Section R18-2-406 (Supp. 87-3).

R18-2-407. Storage piles

A. No person shall cause, suffer, allow, or permit organic or inorganic dust producing material to be stacked, piled, or otherwise stored without taking reasonable precautions such as chemical stabilization, wetting, or covering to prevent excessive amounts of particulate matter from becoming airborne.

B. Stacking and reclaiming machinery utilized at storage piles shall be operated at all times with a minimum fall of material and in such manner, or with the use of spray bars and wetting agents, as to prevent excessive amounts of particulate matter from becoming airborne.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-407 renumbered without change as Section R18-2-407 (Supp. 87-3).

R18-2-408. Mineral tailings

No person shall cause, suffer, allow, or permit construction of mineral tailings piles without taking reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne. Reasonable precautions shall mean wetting, chemical stabilization, revegetation or such other measures as are approved by the Director.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Amended eff. Oct. 2, 1979 (Supp. 79-5). Former Section R9-3-408 renumbered without change as Section R18-2-408 (Supp. 87-3).

R18-2-409. Agricultural practices

No person shall cause, suffer, allow or permit the performance of agricultural practices including but not limited to tilling of land and application of fertilizers without taking reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-409 renumbered without change as Section R18-2-409 (Supp. 87-3).

R18-2-410. Evaluation of nonpoint source emissions

Opacity of an emission from any nonpoint source shall not be greater than 40 percent measured in accordance with the Arizona Testing Manual, Reference Method 9. Open fires permitted under R18-2-402 and R18-2-403 are exempt from this requirement.

Historical Note

Adopted eff. May 14, 1979 (Supp. 79-1). Former Section R9-3-410 renumbered without change as Section R18-2-410 (Supp. 87-3).

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