

**The Helena, Montana PM<sub>2.5</sub> Source  
Apportionment Research Study**

**Final Report  
Revision 1**

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**by**

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## 1.0 Executive Summary

During the winter of 2007/2008, The University of Montana, Center for Environmental Health Sciences (UM-CEHS) conducted a source apportionment program in Helena, Montana for particulate matter less than or equal to 2.5 microns in diameter ( $PM_{2.5}$ ). Located at the extreme southern end of Lewis and Clark County, and adjacent to Jefferson County, the estimated population of Helena was 28,726 as of July 1, 2007 (USCB, 2008a), with an estimated 71,119 in the Helena Micropolitan Statistical Area (USCB, 2008b). The Helena Valley airshed frequently experiences temperature inversions throughout the winter months that contribute to elevated levels of  $PM_{2.5}$ .

The goal of this research program was to identify the major emission sources of  $PM_{2.5}$  in the Helena airshed during the winter of 2007/2008. A Chemical Mass Balance (CMB) computer model was used to apportion the sources of the fine fraction, where information on the chemical composition of the ambient  $PM_{2.5}$  and anticipated  $PM_{2.5}$  emission sources in the Helena airshed served as model inputs. Throughout the program,  $PM_{2.5}$  Federal Reference Method (FRM) air monitors sampled the ambient air every six days from 11/2/07 through 3/1/08. After the samples were collected, they were analyzed by contracted laboratories for mass and chemical composition (including elements, ions, organic/elemental carbon, and  $^{14}C$ ).

For the CMB samples collected during the winter of 2007/2008, the average  $PM_{2.5}$  24-hour concentration was 9.0 micrograms per cubic meter ( $\mu g/m^3$ ), with the highest concentration ( $46.0 \mu g/m^3$ ) measured on 1/25/08. The results of the CMB modeling revealed that wood smoke (likely residential wood combustion) was the major source of  $PM_{2.5}$  throughout the winter sampling program in Helena, contributing an average of 66.4% of the measured  $PM_{2.5}$ . The other sources of  $PM_{2.5}$  identified by the CMB model were ammonium nitrate (18.9%), secondary sulfate (4.9%), street sand (2.9%), automobiles (2.4%), a cement kiln (0.5%), and diesel exhaust (0.3%). Results from the  $^{14}C$  analyses show that an average of 52.1% of the measured  $PM_{2.5}$  came from a new carbon, or wood smoke source. In summary, the CMB model results, coupled with the  $^{14}C$  results, support that wood smoke is the major contributor to the overall  $PM_{2.5}$  mass in the Helena airshed during the winter months.

## **2.0 Overview**

Through six Services (as stated in DEQ Contract No. 506062), a research study was designed by UM-CEHS to identify the sources of PM<sub>2.5</sub> in Helena, Montana. This study included sampling, analytical, and computer modeling components per the following contract services:

Service 1: Establish Methods

Service 2: Monitoring and Data Collection

Service 3: Data Analysis

Service 4: Modeling

Service 5: Quarterly Reports

Service 6: Final Project Report

The following Sections 3.0 through 6.0 of this report provide a description of DEQ Contract Services 1 through 4, while Section 7.0 presents the results and a discussion of the sampling, analytical, and modeling programs, respectively.

### **3.0 Service 1: Establish Methods**

At the start of this project, UM-CEHS reviewed the sampling and analytical methods employed by DEQ in Helena as part of their existing PM<sub>2.5</sub> compliance sampling program. In order to conduct PM<sub>2.5</sub> source apportionment, both the sampling and analytical components were expanded to collect information on the chemical composition of the ambient PM<sub>2.5</sub>. These modifications to the sampling and analytical programs are discussed in the following sections.

### **4.0 Service 2: Monitoring and Data Collection**

#### **4.1 Sampling Program Experimental Method**

Ambient air samples were collected every six days (24-hour) throughout the winter months in Helena beginning 11/2/07 and ending 3/1/08 following the Environmental Protection Agency's (EPA) fixed monitoring schedule. Throughout the program, three FRM PM<sub>2.5</sub> samplers (BGI PQ200) were used to collect the 47-mm filter samples. One sampler collected ambient PM<sub>2.5</sub> samples using a Teflon filter as part of Montana DEQ's compliance sampling program. The other two co-located samplers collected PM<sub>2.5</sub> on quartz filters.

#### **4.2 Sampling Program Quality Assurance / Quality Control (QA/QC)**

Teflon filters are utilized as part of DEQ's normal PM<sub>2.5</sub> sampling program, and were thereby supplied by DEQ. For the quartz filter sampling program, UM-CEHS provided clean PM<sub>2.5</sub> quartz filters to Lewis and Clark County personnel throughout the four month CMB sampling program. These quartz filters were purchased pre-cleaned from Chester LabNet (Tigard, OR) at the onset of the study.

During shipment of clean quartz sample media from the UM-CEHS laboratory to Helena, all filters remained in their protective containers inside an insulated portable cooler equipped with

cold packs. During the 24-hour sampling period, the filters were never subjected to temperatures that exceeded the ambient temperature by more than five degrees Celsius (°C) for more than 30 continuous minutes. Filters were recovered from the samplers by Lewis and Clark County personnel within 48 hours after each sampling event ended. Exposed samples were then refrigerated immediately upon collection. All filters were transported in an insulated portable cooler from Helena to the UM-CEHS laboratory, and stored in a freezer at UM-CEHS until shipped off for further analysis. PM<sub>2.5</sub> filters sent to Chester LabNet and the University of Arizona for chemical analyses were shipped overnight via FedEx in an insulated cooler equipped with cold packs.

Throughout the sampling program, the three Helena PM<sub>2.5</sub> FRM samplers were maintained by DEQ. In addition, the samplers were audited by DEQ with an independent transfer standard during the four month program to verify the accurate measurement of air flow rates, ambient/filter temperatures, and barometric pressures.

## **5.0 Service 3: Data Analysis**

### **5.1 PM<sub>2.5</sub> Speciation Data**

For the Teflon filters collected during the Helena (and the other monitoring sites throughout the state of Montana) PM<sub>2.5</sub> compliance sampling program, the Montana DEQ contracts with Intermountain Labs (IML, Sheridan, WY) for gravimetric analyses. Since IML does not have an X-Ray Fluorescence instrument needed to conduct the elemental analyses required for the CMB source apportionment computer modeling, IML sent archived Helena Teflon filters to Chester LabNet (Tigard, OR) for the elemental analyses. Following the elemental analyses, Chester LabNet sent the Helena Teflon filters back to IML for archiving. In addition to the elemental analyses on the Teflon filters, quartz filters were also analyzed at Chester LabNet.

To summarize, the following chemical speciation analyses were conducted on the Helena Teflon and quartz filters, respectively:

#### **Teflon Filter**

- **Gravimetric (IML):** PM<sub>2.5</sub> mass by a microbalance.
- **Elemental (Chester LabNet):** 38 trace elements by energy-dispersive X-Ray Fluorescence (EDXRF).

#### **Quartz Filter**

- **Carbon Species (Chester LabNet):** Elemental Carbon (EC) and Organic Carbon (OC) by Thermal Optical Reflectance (TOR).
- **Cations/Anions (Chester LabNet):** Cations (ammonium, potassium, sodium,) and anions (nitrate, sulfate, chloride, and fluoride) by Ion Chromatography (IC). Calcium and magnesium were analyzed by Inductively Coupled Plasma (ICP).

Helena PM<sub>2.5</sub> mass results, expressed in terms of microgram per cubic meter (µg/m<sup>3</sup>) and sampler air flow rates/volumes were provided by DEQ to UM-CEHS for use in the CMB model.

## 5.2 Carbon 14 (<sup>14</sup>C) Analysis

The abundance of <sup>14</sup>C in an organic molecule provides information on the source of its carbon. If <sup>14</sup>C is present at concentrations relatively equal to the 'normal' levels found in the atmosphere, then the molecule must have come from a recent plant product. If a molecule contains no detectable <sup>14</sup>C, it must have come from a petrochemical or some other ancient source. Thus, analyzing the PM<sub>2.5</sub> samples for <sup>14</sup>C provides additional information on the sources of PM<sub>2.5</sub> in an airshed. Specifically, it helps to separate the PM<sub>2.5</sub> emitted by wood combustion ('new' carbon - measurable <sup>14</sup>C) versus that emitted by fossil fuel combustion, such as diesel exhaust ('old' carbon - no <sup>14</sup>C). For the Helena program, <sup>14</sup>C analyses were conducted on 47-mm quartz filter samples at the University of Arizona's (UA) Accelerator Mass Spectrometry Laboratory Facility.

## 5.3 Analytical Program QA/QC

Both Chester LabNet and the University of Arizona were responsible for QA/QC activities within their laboratory. A full QA/QC plan can be provided by Chester LabNet and / or the University of Arizona upon request.

Field and trip blanks provide an estimate of total measurement system contamination. By looking at the results of the field/trip blanks, the amount of contamination due to field and filter shipping activities can be estimated. UM-CEHS collected three PM<sub>2.5</sub> quartz filter field blanks in Helena throughout the 2007/2008 program. For the compliance sampling, the use of field blanks (Teflon filters) is a standard requirement of the Montana DEQ QA/QC program.

## 6.0 Service 4: Modeling

In this project, the most recent version of the Chemical Mass Balance (CMB) computer model (version 8.2) was utilized to apportion the sources of PM<sub>2.5</sub> in Helena. The CMB receptor model (Friedlander, 1973; Cooper and Watson, 1980; Gordon, 1980, 1988; Watson, 1984; Watson et al., 1984; 1990; Hidy and Venkataraman, 1996) consists of a solution to linear equations that expresses each receptor chemical concentration as a linear sum of products of source fingerprint abundances and contributions. The modeling process began by loading the ambient PM<sub>2.5</sub> speciation data (mass, elements, ions, and OC/EC) with associated uncertainties into the model, along with PM<sub>2.5</sub> source information (source profile abundances, or the mass fraction of an analyte in the emissions from each source type) from the Helena airshed. The 50 parameters listed in Tables 3 through 5 were used as fitting species in the Helena CMB model. For each sample day, the CMB modeling process began by selecting combinations of 75 sources and 50 chemical species in an effort to reconstruct the measured PM<sub>2.5</sub> mass and chemical composition. Multiple combinations would be tried for each sample run, with an evaluation of the diagnostic measures conducted each time until an optimal fit could be obtained. The resulting output file contained the source contribution estimate (SCE) of each identified source to each measured species, along with the associated standard errors (STD ERR) for each identified source.

## 6.1 CMB Model Source Profiles

After discussions with DEQ personnel, a list of sources that could potentially contribute PM<sub>2.5</sub> to the Helena airshed was developed. For each identified source, an attempt was made to locate a source profile. Source profiles are the fractional mass abundances of measured chemical species relative to primary PM<sub>2.5</sub> mass in source emissions, and are part of the input data loaded into the CMB model. Source profiles represent a general source category rather than any local, individual, PM<sub>2.5</sub> emission source.

Table 1 presents the source profiles used in the 2007/2008 Helena CMB study. The profiles in this table are listed together as source groups, and can be broken down into profiles for street sand and road dust (Profiles 1- 10 and 75), pure secondary source emissions (Profiles 11-13), gasoline and diesel exhaust emissions (Profiles 14 – 40), tire and brake wear (Profiles 41 - 46), meat cooking (Profiles 47 - 50), deicer (Profile 51), and residential wood combustion (Profiles 52 – 71). Since this source list was also used for the Belgrade, Butte, and Hamilton PM<sub>2.5</sub> source apportionment studies, local industrial source types are also listed in Table 1 (Profiles 72 – 74), including grain handling dust, cement kiln, and gypsum calciner sources. Multiple source profiles for each source were used because source compositions can vary substantially among sources, even within a single source over an extended period of time. These variations are caused by:

- 1) transformation and deposition between the emissions point and the receptor;
- 2) differences in fuel type and operating processes between similar sources or the same source in time; and
- 3) uncertainties or differences between the source profile measurement methods (Watson et al., 1998).

Source profiles were either taken directly from the most recent version of SPECIATE 4.0 (USEPA, 2006) or from previous Missoula Valley CMB applications (Carlson, 1990; Schmidt, 1996; Ward and Smith, 2004). SPECIATE 4.0 is EPA's repository of Total Organic Compound (TOC) and Particulate Matter (PM) speciated source profiles for use in source apportionment studies. For each source found in the database, both the compound fraction and uncertainty for the source-specific compounds are presented. Since Missoula and Helena have similar topographies and many of the same sources of PM<sub>2.5</sub>, several of the CMB source profiles developed in past Missoula CMB applications were included in the Helena PM<sub>2.5</sub> source apportionment program. These include profiles for street sand (Profiles 1 - 4), secondary sulfate (Profile 11), secondary ammonium sulfate (Profile 12), secondary ammonium nitrate (Profile 13), diesel train (Profile 39) and diesel truck exhaust (Profile 40), deicer (Profile 51), and residential wood combustion (Profile 54). All SPECIATE and Missoula CMB profiles used in the Helena CMB were reviewed before being loaded into the CMB model. For those chemical species known to be absent from specific source types, default values of zero for the mass fraction and uncertainty of 0.0001 were used.

One assumption of the CMB model is that compositions of source emissions are constant over the period of ambient and source sampling, and that chemical species do not react with each other. CMB is well suited for apportioning sources of primary aerosols (those emitted directly as particles). However, it is difficult to attribute secondary aerosols formed through gas-to-particle

transformation in the atmosphere to specific sources. Sulfate, nitrate, and ammonium abundances in directly emitted particles are not sufficient to account for the concentrations of these species measured in the atmosphere. Therefore, to account for secondary aerosol contributions to PM<sub>2.5</sub> mass, sulfate (Profile 11), ammonium sulfate (Profile 12), and ammonium nitrate (Profile 13) were expressed as “pure” secondary source profiles, and represented by their chemical form in the model.

**Table 1: PM<sub>2.5</sub> Source Profiles Used in the Helena CMB.**

Profile	ID	Description
1	ST_SANDF	CITY STREET SANDING PILE, STREET SAND
2	ERN_RUSF	INTERSECTION ERNEST AND RUSSEL ST, STREET SAND
3	RUS_STF2	RUSSEL ST, STREET SAND
4	DESP_LTF	DESPERADO PARKING LOT, STREET SAND
5	RDDST_BT	SPECIATE 411042.5, PAVED ROAD DUST - BUTTE, MT
6	RDDST_CP	SPECIATE 411302.5, PAVED ROAD DUST – COMPOSITE
7	RDDST_HE	SPECIATE 411052.5, PAVED ROAD DUST - EAST HELENA, MT
8	RDDST_MS	SPECIATE 411012.5, PAVED ROAD DUST - MISSOULA, MT
9	UNDST_CP	SPECIATE 412202.5, UNPAVED ROAD DUST – COMPOSITE
10	UNDST_HE	SPECIATE 412042.5, UNPAVED ROAD DUST - EAST HELENA, MT
11	SO4_FZER	SULFATE (SO4 IS ONLY SPECIE, THEREFORE IS ONLY NONZERO CONCENTRATION)
12	NH4SO4F2	AMMONIUM SULFATE (INCLUDES NH4)
13	NH4NO3F2	AMMONIUM NITRATE (INCLUDES NH4)
14	LDV_PBCF	SPECIATE 311052.5 LIGHT DUTY VEHICLE-LEADED COMPOSITE
15	LDV_XPBF	SPECIATE 312022.5 LIGHT DUTY VEHICLE-UNLEADED
16	LDV_DSLF	SPECIATE 321022.5 LIGHT DUTY VEHICLE-DIESEL
17	LDV_DS2F	SPECIATE 321032.5 LIGHT DUTY VEHICLE-DIESEL (2ND PROFILE OF THIS TYPE)
18	HDV_DSLF	SPECIATE 322032.5, HEAVY DUTY VEHICLE-DIESEL
19	LDV_NCAT	SPECIATE 311082.5, LIGHT DUTY VEHICLE - NON CATALYST
20	LDV_WCAT	SPECIATE 311072.5, LIGHT DUTY VEHICLE - WITH CATALYST
21	HDV_TRK1	SPECIATE 322022.5, HEAVY DUTY DIESEL
22	HDV_TRK2	SPECIATE 322082.5, HEAVY DUTY DIESEL TRUCKS
23	LDV_UNL1	SPECIATE 312012.5, LIGHT DUTY VEHICLE – UNLEADED
24	LDV_UNL2	SPECIATE 312032.5, LIGHT DUTY VEHICLE – UNLEADED
25	GASEXST1	SPECIATE 3875, GASOLINE EXHAUST - WINTER, SMOKER
26	GASEXST2	SPECIATE 3884, GASOLINE EXHAUST - WINTER, LOW EMITTER PROFILE 1
27	GASEXST3	SPECIATE 3888, GASOLINE EXHAUST - WINTER, LOW EMITTER PROFILE 2
28	GASEXST4	SPECIATE 3892, GASOLINE EXHAUST - WINTER, HIGH EMITTER PROFILE 1
29	GASEXST5	SPECIATE 3896, GASOLINE EXHAUST - WINTER, HIGH EMITTER PROFILE 2
30	GASEXST6	SPECIATE 3900, GASOLINE EXHAUST - WINTER, NON-SMOKER
31	GASEXST7	SPECIATE 3904, GASOLINE EXHAUST - WINTER, SMOKER PROFILE 1
32	GASEXST8	SPECIATE 3908, GASOLINE EXHAUST - WINTER, SMOKER PROFILE 2
33	DESLXST1	SPECIATE 3878, DIESEL EXHAUST PROFILE 1
34	DESLXST2	SPECIATE 3879, DIESEL EXHAUST PROFILE 2
35	DESLXST3	SPECIATE 3880, DIESEL EXHAUST PROFILE 3
36	DESLXST4	SPECIATE 3912, DIESEL EXHAUST PROFILE 4
37	DESLXST5	SPECIATE 3913, DIESEL EXHAUST PROFILE 5
38	DESLXST6	SPECIATE 3914, DIESEL EXHAUST PROFILE 6



39	D_TRAINF	DIESEL TRAIN (SENT FROM MISSOULA)
40	D_TRUCKF	DIESEL TRUCK (SENT FROM MISSOULA)
41	TIRE_WR1	SPECIATE 340022.5, TIRE WEAR PROFILE 1
42	TIRE_WR2	SPECIATE 340032.5, TIRE WEAR PROFILE 2
43	TIRE_WR3	SPECIATE 340082.5, TIRE WEAR PROFILE 3
44	TIRE_WR4	SPECIATE 3156, TIRE WEAR PROFILE 4
45	BRAKEASB	SPECIATE 340042.5, BRAKE LINING - ASBESTOS
46	BRAKEWER	SPECIATE 3157, BRAKE WEAR
47	MTCOOKCH	SPECIATE 160002.5, MEAT COOKING - CHARBROILING
48	MTCOOKFR	SPECIATE 160012.5, MEAT COOKING - FRYING
49	COOKING1	SPECIATE 4383, COOKING
50	COOKCHAR	SPECIATE 91005, COOKING - CHARBROILING COMPOSITE
51	DEICER_F	MAGNESIUM CHLORIDE DEICER (CHEMICAL ANALYSIS SENT FROM MISSOULA)
52	RWC_MEDF	SPECIATE 421042.5 RESIDENTIAL WOOD SMOKE FROM MEDFORD, OR
53	RWC_POCF	SPECIATE 421052.5 RESIDENTIAL WOOD SMOKE FROM POCATELLO, ID
54	RWC_F222	RESIDENTIAL WOOD COMBUSTION (SUPPLIED BY MISSOULA)
55	RWC_ALON	SPECIATE 423182.5, RESIDENTIAL WOOD COMBUSTION
56	RWC_COMP	SPECIATE 423032.5, RESIDENTIAL WOOD COMBUSTION, COMPOSITE
57	RWB_COMP	SPECIATE 423302.5, COMPOSITE OF RESIDENTIAL WOODBURNING SOURCES
58	WDSTVALL	SPECIATE 421022.5, WOOD STOVES - AVERAGE ALL FUELS
59	WDSTVPIN	SPECIATE 421012.5, WOOD STOVES - PINE FUELS
60	RSWDBRN1	SPECIATE 3235, RESIDENTIAL WOOD BURNING PROFILE 1
61	RSWDBRN2	SPECIATE 3236, RESIDENTIAL WOOD BURNING PROFILE 2
62	RSWDBRN3	SPECIATE 3238, RESIDENTIAL WOOD BURNING PROFILE 3
63	RSWDBRN4	SPECIATE 3239, RESIDENTIAL WOOD BURNING PROFILE 4
64	RSWDBRN5	SPECIATE 3240, RESIDENTIAL WOOD BURNING PROFILE 5
65	RSWDBRN6	SPECIATE 3769, RESIDENTIAL WOOD BURNING PROFILE 6
66	RSWDBRN7	SPECIATE 3770, RESIDENTIAL WOOD BURNING PROFILE 7
67	RWCCOMP1	SPECIATE 423192.5, RESIDENTIAL WOOD COMBUSTION COMPOSITE
68	RWCCOMP2	SPECIATE 423312.5, RESIDENTIAL WOODSTOVE COMPOSITE
69	RWCHSCMP	SPECIATE 91031, RESIDENTIAL WOOD COMBUSTION: HARDSOFT - COMPOSITE
70	RWCHSNAC	SPECIATE 91032, RESIDENTIAL WOOD COMBUSTION: HARDSOFTN/A - COMPOSITE
71	RWCSFTCP	SPECIATE 91033, RESIDENTIAL WOOD COMBUSTION: SOFT - COMPOSITE
72	GRAINDST	SPECIATE 214012.5, GRAIN HANDLING DUST
73	CMNTKILN	SPECIATE 272032.5, CEMENT KILN (COAL-FIRED)
74	GYPSCALC	SPECIATE 275012.5, GYPSUM CALCINER
75	SOILDUST	SPECIATE 413062.5, SOIL DUST - EAST HELENA, MONTANA

## 6.2 CMB Model Program QA/QC

A comprehensive QA/QC plan was applied throughout the CMB modeling program to ensure accurate results, including the use of the CMB validation protocol (Watson et al., 2004). The QA/QC protocol:

- 1) determines model applicability;
- 2) selects a variety of profiles to represent identified contributors;
- 3) evaluates model outputs and performance measures;
- 4) identifies and evaluates deviations from model assumptions;
- 5) identifies and corrects model input deficiencies;

- 6) verifies consistency and stability of source contribution estimates; and
- 7) evaluates CMB results with respect to other data analysis and source assessment methods.

For each model run, evaluations of several different combinations of source profiles were used, with the number of chemical species always exceeding the number of source types. Statistical parameters used to evaluate the validity of source contribution estimates included TSTAT, R<sup>2</sup>, Chi<sup>2</sup>, DF, and R/U ratios, and are described in Table 2. These fitting parameters have to be within the EPA target ranges for the modeling results to be considered valid. It should also be noted that concentrations of species found on field/trip blanks were not subtracted (or blank-corrected) from the ambient sample concentrations before the modeling was conducted.

**Table 2: Statistical Criteria for CMB Model.**

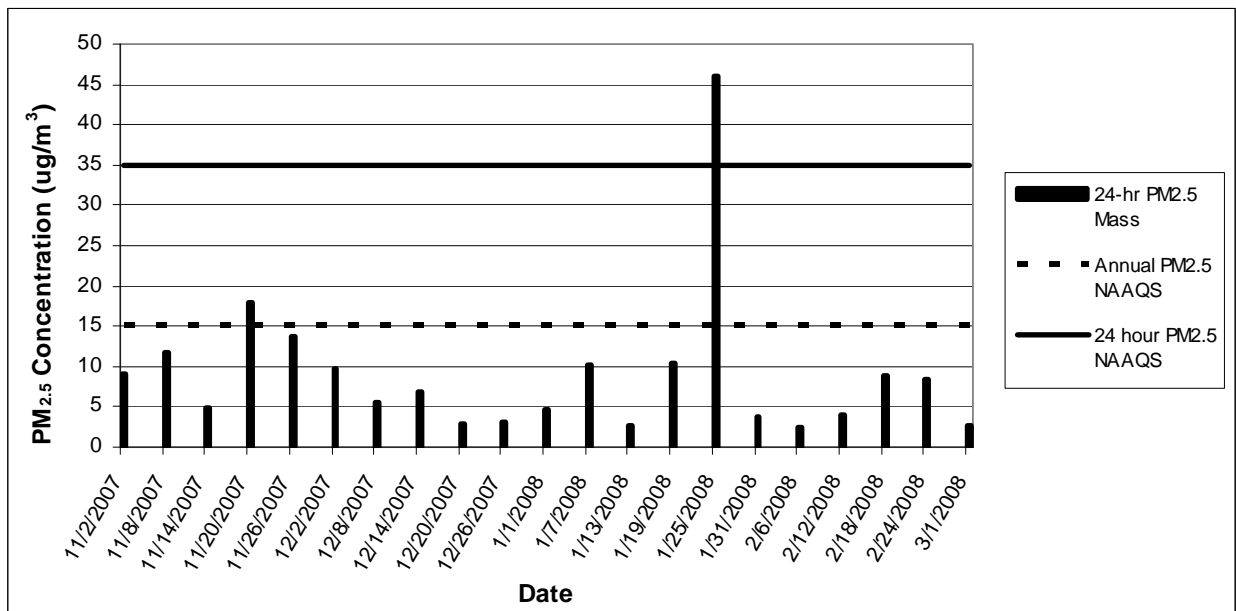
Output / Statistic	Abbreviation	EPA Target	Explanation
Std. Error	STD ERR	<SCE	The standard error of the SCE.
T-statistic	TSTAT	> 2.0	The ratio of the value of the SCE to the uncertainty in the SCE. A T-STAT greater than 2 means that the SCE has a relative uncertainty of less than 50%.
R-square	R-SQUARE (R <sup>2</sup> )	0.8 to 1.0	A measure of the variance of the ambient concentration explained by the calculated concentration.
Chi-square	CHI-SQUARE (Chi <sup>2</sup> )	0.0 to 4.0	A term that compares the difference between the calculated and measured ambient concentrations to the uncertainty of the difference. A perfect fit has a chi-square of 0.0, and a chi-square less than 2 usually indicates a good fit.
Percent Mass Explained	% MASS	100% ± 20%	The ratio of the total calculated to measured mass.
Degrees of Freedom	DF	> 5	The difference between the number of fitting species and the number of fitting sources.
Ratio of Calculated to Measured	RATIO C/M	0.5 to 2.0	The ratio of the calculated to measured concentration of an ambient species. Ideally, this value should be 1.0.
Ratio of Residual to Uncertainty	RATIO R/U	-2.0 to 2.0	The ratio of the residual (calculated minus measured) to the uncertainty of the residual (square root of the sum of squares of the uncertainties).

## 7.0 Results and Discussion

### 7.1 PM<sub>2.5</sub> Mass and Speciation Data

The Helena PM<sub>2.5</sub> samplers collected 24-hour integrated samples using Teflon and quartz filter media for the target analytes. From the pre-determined CMB sample days for this program, Figure 1 presents the 24-hour PM<sub>2.5</sub> mass concentrations (in µg/m<sup>3</sup>) measured from 11/2/07 through 3/1/08. Within Figure 1, the graphed sample concentrations can also be compared to the 24-hour (35 µg/m<sup>3</sup>) and annual (15 µg/m<sup>3</sup>) National Ambient Air Quality Standards (NAAQS).

From November 2007 through March 2008 (as measured every six days), 24-hour PM<sub>2.5</sub> concentrations averaged 9.0 µg/m<sup>3</sup>, with a maximum concentration of 46.0 µg/m<sup>3</sup> recorded on 1/25/08. All scheduled samples were successfully collected as part of the Helena program.



**Figure 1: Helena, Montana PM<sub>2.5</sub> Mass Concentrations.**

Tables 3 through 5 present the average concentrations (in  $\mu\text{g}/\text{m}^3$ ) of mass, elements, ions, and OC/EC, respectively, measured throughout the four-month sampling program. The minimum detection limits (MDL) in  $\mu\text{g}/\text{m}^3$  for each compound are also presented in each table, with the bolded values indicating analyte concentrations measured at or above the MDL. For the elements, the MDL was calculated by taking the average uncertainty (per analyte) for all of the sample runs, and multiplying by three. The three-sigma uncertainty describes the range at 99.7% confidence. For anions and cations, the MDLs were provided by Chester LabNet. Finally, for OC/EC/TC (total carbon), it was recommended by Chester LabNet that the average of the field blanks be used for the MDL.

**Table 3: Average PM<sub>2.5</sub> Mass and Elemental Concentrations.**

Analyte	Concentration (µg/m <sup>3</sup> )	MDL (µg/m <sup>3</sup> )	Analyte	Concentration (µg/m <sup>3</sup> )	MDL (µg/m <sup>3</sup> )
<b>Mass</b>	<b>9.0</b>	0.630			
<b>Sodium</b>	0.020	0.074	<b>Germanium</b>	0.000	0.001
<b>Magnesium</b>	0.005	0.019	<b>Arsenic</b>	0.000	0.002
<b>Aluminum</b>	<b>0.027</b>	0.015	<b>Selenium</b>	0.000	0.001
<b>Silicon</b>	<b>0.080</b>	0.020	<b>Bromine</b>	<b>0.002</b>	0.001
<b>Phosphorus</b>	<b>0.003</b>	0.003	<b>Rubidium</b>	0.000	0.001
<b>Sulfur</b>	<b>0.168</b>	0.029	<b>Strontium</b>	0.000	0.001
<b>Chlorine</b>	<b>0.018</b>	0.009	<b>Yttrium</b>	0.000	0.002
<b>Potassium</b>	<b>0.062</b>	0.013	<b>Zirconium</b>	0.000	0.002
<b>Calcium</b>	<b>0.039</b>	0.009	<b>Molybdenum</b>	0.000	0.003
<b>Titanium</b>	<b>0.003</b>	0.001	<b>Palladium</b>	0.000	0.007
<b>Vanadium</b>	0.000	0.001	<b>Silver</b>	0.001	0.007
<b>Chromium</b>	0.000	0.001	<b>Cadmium</b>	0.001	0.008
<b>Manganese</b>	0.001	0.002	<b>Indium</b>	0.001	0.008
<b>Iron</b>	<b>0.046</b>	0.007	<b>Tin</b>	0.001	0.010
<b>Cobalt</b>	0.000	0.004	<b>Antimony</b>	0.001	0.010
<b>Nickel</b>	<b>0.002</b>	0.002	<b>Barium</b>	0.003	0.005
<b>Copper</b>	<b>0.010</b>	0.002	<b>Lanthanum</b>	0.000	0.004
<b>Zinc</b>	<b>0.021</b>	0.004	<b>Mercury</b>	0.001	0.002
<b>Gallium</b>	0.000	0.001	<b>Lead</b>	<b>0.005</b>	0.003

Note: MDL–minimum detection limit. Bolded values indicate concentrations measured at or above the MDL.

**Table 4: Average PM<sub>2.5</sub> Ion Concentrations.**

Analyte	Concentration (µg/m <sup>3</sup> )	MDL (µg/m <sup>3</sup> )
<b>Sulfate</b>	0.643	0.062
<b>Nitrate</b>	1.377	0.062
<b>Ammonium</b>	0.431	0.062
<b>Chloride</b>	0.101	0.062
<b>Potassium</b>	0.095	0.062
<b>Fluoride</b>	0.115	0.062
<b>Sodium</b>	1.536	0.125
<b>Calcium</b>	0.424	0.010
<b>Magnesium</b>	0.054	0.002

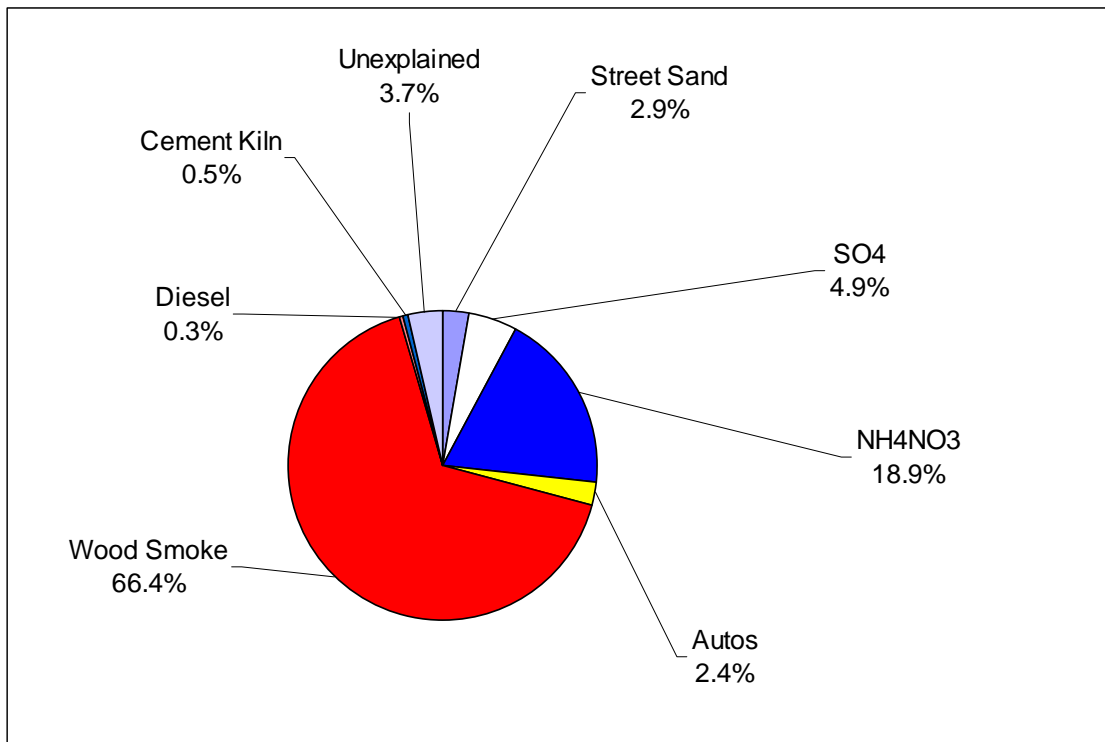
**Table 5: Average PM<sub>2.5</sub> Total, Elemental and Organic Carbon Concentrations.**

Analyte	Concentration (µg/m <sup>3</sup> )	MDL (µg/m <sup>3</sup> )
<b>Total Carbon</b>	4.931	0.230
<b>Organic Carbon</b>	4.494	0.229
<b>Elemental Carbon</b>	0.434	0.001

Table 3 presents the average concentrations (in  $\mu\text{g}/\text{m}^3$ ) of all of the elements measured throughout the sampling program. Out of the 38 elements, only 14 were measured at or above their reported MDL as noted by the bolded fonts. Sulfur ( $0.168 \mu\text{g}/\text{m}^3$ ) had the highest concentration of the measured elements, followed by silicon ( $0.080 \mu\text{g}/\text{m}^3$ ) and potassium ( $0.062 \mu\text{g}/\text{m}^3$ ). The average concentrations of the ion species in Table 4, and the total carbon, organic carbon and elemental carbon in Table 5 were all measured above the MDLs. Sodium ( $1.5 \mu\text{g}/\text{m}^3$ ) had the highest concentration of any of the measured ions, followed by nitrate ( $1.4 \mu\text{g}/\text{m}^3$ ). Total carbon levels ( $4.9 \mu\text{g}/\text{m}^3$ ) were mostly composed of organic carbon ( $4.5 \mu\text{g}/\text{m}^3$ ).

## 7.2 Chemical Mass Balance Modeling

In total, seven source profile types (see Figure 2) were identified as contributing to the Helena  $\text{PM}_{2.5}$  throughout the winter of 2007/2008, including street sand, secondary sulfate ( $\text{SO}_4$ ), secondary ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ), automobiles, diesel exhaust, a cement kiln, and wood smoke.



**Figure 2: Helena, Montana  $\text{PM}_{2.5}$  Source Contribution Estimates.**

The results of the CMB modeling revealed that wood smoke (likely residential wood combustion) is the major source of  $\text{PM}_{2.5}$  throughout the winter months in Helena, contributing an average of 66.4% of the measured  $\text{PM}_{2.5}$ . The other sources of  $\text{PM}_{2.5}$  identified by the CMB model were ammonium nitrate (18.9%), secondary sulfate (4.9%), street sand (2.9%), automobiles (2.4%), a cement kiln (0.5%), and diesel exhaust (0.3%). An average of 3.7% of the measured  $\text{PM}_{2.5}$  was unexplained by the CMB model.

The wood smoke source identified in the CMB model (66.4%) should be viewed as a general source predominantly composed of woodstove emissions. In addition to residential woodstoves, biomass combustion emission sources could have contributed to this source profile, including smoke from prescribed fires, residential open burning of biomass waste, and small industrial sources.

Two secondary aerosols, ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ) and sulfate ( $\text{SO}_4$ ), were identified by the CMB model as contributing to  $\text{PM}_{2.5}$  concentrations in Helena during the winter of 2007/2008. “Pure secondary” aerosols such as ammonium nitrate (18.9%) and sulfate (4.9%) are actually formed through gas-to-particle transformations in the atmosphere, and are represented by their chemical form in the model. Ammonium nitrate is an extremely volatile species, and is not detected in the particle form during the warmer months. Ammonia ( $\text{NH}_3$ ) and oxides of nitrogen ( $\text{NO}_x$ ) are the precursors for ammonium nitrate particles (Seinfeld and Pandis, 1998), and a mechanism for the formation of ammonium nitrate has been reported by Stockwell et al., (2000).  $\text{PM}_{2.5}$  has been found to correlate with gaseous emissions of  $\text{NO}_x$  from vehicles, with heavy duty vehicles contributing significantly greater amounts of  $\text{NO}_x$  and particulate matter on a per vehicle basis than light duty vehicles (Gillies et al., 2001). Between 40 and 45% of all  $\text{NO}_x$  emissions in the United States are estimated to come from transportation, with about half of this coming from light-duty gasoline trucks and cars and approximately one-quarter from heavy-duty gasoline and diesel vehicles (Seinfeld and Pandis, 1998; Dreher and Harley, 1998). Other sources of  $\text{NO}_x$  in the Helena Valley might include small industry, natural gas furnaces, and residential wood combustion (Schmidt, 1996). Ammonia emissions to the atmosphere arise from many sources including the decay of livestock waste, use of chemical fertilizers, emissions from sewage treatment plants, biological processes in soils, and to a lesser extent, combustion processes (Fraser and Cass, 1998). The source of the secondary sulfate might include the transportation sector, the burning of fuel oils for home heating, and/or “normal” background levels.

The CMB model determined that vehicles (both gasoline-powered and diesel) were minor sources of  $\text{PM}_{2.5}$  in Helena.  $\text{PM}_{2.5}$  emitted directly from gasoline-powered vehicles (2.4%) were detected on four of the 21 sample days, while diesel exhaust (0.3%) was detected on only one sampling day (1/7/08) throughout the program.

Street sand was a small, yet persistent source of  $\text{PM}_{2.5}$  in Helena (2.9%). It was detected in 13 of the 21 model runs.

The cement kiln source profile (0.5%) was a very small contributor to the overall  $\text{PM}_{2.5}$  in Helena during the winter of 2007/2008. It was detected by the model on only two occasions (11/26/07 and 12/14/07) at very low amounts.

Table 6 presents the  $\text{PM}_{2.5}$  sources identified by the CMB model for each sample day throughout the 2007/2008 winter sampling program, while Appendix A presents their corresponding standard errors (STD ERR). The standard error is a single standard deviation. When a standard error value is multiplied by two or three times, the result may be taken as a measure of the upper and lower limit of an individual source’s contribution. There is about a 66% probability that the true source contribution is within one standard error and about a 95% probability that the true

contribution is within two standard errors of the source contribution estimate. Appendix B presents the raw input files for the Helena CMB model (including the ambient data and source profiles), while Appendix C presents the final outputs for the Helena CMB model.

**Table 6: PM<sub>2.5</sub> Source Contribution Estimates (µg/m<sup>3</sup>) by Sample Day.**

Date	PM <sub>2.5</sub> Mass	Street Sand	Secondary Sulfate	Amm. Nitrate	Autos	Diesel Exhaust	Cement Kiln	Wood Smoke	Unexplained Mass
11/2/2007	9.0	0.9	0.7	0.7	0.0	0.0	0.0	6.5	0.1
11/8/2007	11.8	1.9	0.9	0.8	0.0	0.0	0.0	8.1	0.0
11/14/2007	4.8	0.4	0.3	0.4	0.8	0.0	0.0	3.1	-0.2
11/20/2007	17.9	0.0	1.5	2.1	0.0	0.0	0.0	14.4	-0.1
11/26/2007	13.8	0.0	0.3	2.0	0.0	0.0	0.6	11.1	-0.2
12/2/2007	9.7	0.0	0.8	2.4	0.0	0.0	0.0	6.4	0.1
12/8/2007	5.6	0.2	0.2	0.8	0.0	0.0	0.0	4.3	0.0
12/14/2007	6.9	0.5	0.1	0.6	1.6	0.0	0.5	3.7	0.0
12/20/2007	2.8	0.1	0.1	0.3	0.0	0.0	0.0	2.8	-0.5
12/26/2007	3.0	0.1	0.1	0.4	0.0	0.0	0.0	2.5	-0.1
1/1/2008	4.6	0.3	0.3	0.6	0.0	0.0	0.0	3.4	0.0
1/7/2008	10.1	0.0	0.2	1.0	0.0	0.6	0.0	8.4	0.0
1/13/2008	2.7	0.1	0.1	0.1	0.0	0.0	0.0	2.5	-0.2
1/19/2008	10.3	0.0	0.5	3.6	0.0	0.0	0.0	6.2	-0.1
1/25/2008	46.0	0.0	1.6	16.3	0.0	0.0	0.0	28.6	-0.5
1/31/2008	3.7	0.1	0.1	0.3	0.0	0.0	0.0	4.4	-1.2
2/6/2008	2.4	0.0	0.1	0.2	0.0	0.0	0.0	2.3	-0.2
2/12/2008	4.0	0.2	0.1	0.3	1.2	0.0	0.0	2.4	-0.2
2/18/2008	8.8	0.5	0.3	1.2	1.2	0.0	0.0	5.4	0.2
2/24/2008	8.5	0.0	1.1	3.4	0.0	0.0	0.0	4.1	-0.2
3/1/2008	2.6	0.3	0.2	0.4	0.0	0.0	0.0	1.7	0.0
<b>Average</b>	<b>9.0</b>	<b>0.3</b>	<b>0.5</b>	<b>1.8</b>	<b>0.2</b>	<b>0.03</b>	<b>0.1</b>	<b>6.3</b>	<b>-0.2</b>

Source apportionment was conducted on some sample days in which there was a very small PM<sub>2.5</sub> mass detected. If the measured concentration is less than 5 µg/m<sup>3</sup>, the percent mass may be outside of the acceptable ranges because the uncertainty in the mass measurement is approximately 1 to 2 µg/m<sup>3</sup>. This resulted in less than desirable statistical fittings for those days with low measured PM<sub>2.5</sub> mass.

### 7.3 <sup>14</sup>C Data

The University of Arizona's Accelerator Mass Spectrometry Laboratory Facility conducted <sup>14</sup>C analyses on the quartz filter samples collected throughout the program in Helena. From these results, UA calculated the percent wood smoke component of the PM<sub>2.5</sub>, with the results presented in Table 7.

**Table 7: <sup>14</sup>C Results.**

<b>Date</b>	<b>PM<sub>2.5</sub> Mass (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>% PM<sub>2.5</sub> Resulting from Wood Smoke</b>
11/2/2007	9.0	71.0
11/8/2007	11.8	46.9
11/14/2007	4.8	54.6
11/20/2007	17.9	64.0
11/26/2007	13.8	66.4
12/2/2007	9.7	65.7
12/8/2007	5.6	54.7
12/14/2007	6.9	45.9
12/20/2007	2.8	35.1
12/26/2007	3.0	39.1
1/1/2008	4.6	48.5
1/7/2008	10.1	57.5
1/13/2008	2.7	32.5
1/19/2008	10.3	57.2
1/25/2008	46.0	65.6
1/31/2008	3.7	45.1
2/6/2008	2.4	54.5
2/12/2008	4.0	45.3
2/18/2008	8.8	74.9
2/24/2008	8.5	45.4
3/1/2008	2.6	24.3
<b>Average</b>	<b>9.0</b>	<b>52.1%</b>

The following equation was provided by the University of Arizona to determine the wood smoke component of the measured ambient PM<sub>2.5</sub>, where:

- FM(total) = fraction modern carbon reported,
- FM(wood) = fraction modern carbon of wood smoke,
- FM(coal) = fraction modern carbon of fossil fuel,
- FM (blank) = carbon measured on the blank filter.



$$Fm(total) = \frac{mass(wood)}{mass(total)} Fm(wood) + \frac{mass(coal)}{mass(total)} Fm(coal) + \frac{mass(blank)}{mass(total)} Fm(blank),$$

now if,

$$Fm(blank) = 0.459$$

$$mass(blank) = 0.014 \text{ mg}$$

$$Fm(wood) = 1.075$$

and we assume,

$$Fm(coal) = 0,$$

we get,

$$mass(wood) = \frac{(Fm(total) \times mass(total)) - (Fm(blank) \times mass(blank))}{Fm(wood)}$$

and,

$$\%(wood) = \frac{mass(wood)}{mass(total)} \times 100.$$

As  $mass(blank) \rightarrow 0$ , this becomes :

$$\%(wood) = \frac{Fm(total)}{Fm(wood)} \times 100$$

There are three assumptions that must be made before using this equation. The first assumption is that there are two distinct fractions for the sample (old and new carbon). The second assumption is that  $Fm(coal) = 0$ , since the carbon source is ancient. The final assumption is that the  $Fm(wood)$  is essentially that of modern atmospheric carbon, which is approximately 1.075.

When using the values for fraction of modern carbon for each sample (found in Table 7), the percent wood smoke component of the  $PM_{2.5}$  can be calculated. Results show that an average of 52.1% of the measured  $PM_{2.5}$  came from new carbon, or a wood smoke source. In summary, the  $^{14}C$  results confirm the wood smoke contribution (new carbon source) to the overall  $PM_{2.5}$  mass in the Helena airshed.

## 7.4 Sampling Program QA/QC

For the Helena sampling program, Montana DEQ maintained and audited the  $PM_{2.5}$  FRM samplers.

## 7.5 Analytical Program QA/QC

Chester LabNet (speciation analyses), IML (gravimetric analyses), and the University of Arizona ( $^{14}C$ ) were responsible for QA/QC activities within their respective laboratories. To monitor for artifact contamination in the field and in the laboratory, both Teflon and quartz filter field blanks were collected throughout the sampling programs. For the Teflon filters, eight total field blanks were collected throughout the entire four-community study, and analyzed for elements by Chester LabNet. Since UM-CEHS cannot determine from which airshed these filters came from, the average analyte concentrations ( $\mu\text{g}/\text{filter}$ ) of these eight field blanks were calculated, and then divided by the program average sample volume collected ( $24.04 \text{ m}^3$ ). The Teflon filter field blank elemental results (including field blanks from Belgrade, Butte, Hamilton, and Helena) are presented in Table 8. For the quartz filter field blanks, results are community specific. Three quartz filter field blanks were collected throughout the four-month Helena program. From these

quartz filters, ions and OC/EC were analyzed, with the results ( $\mu\text{g}/\text{filter}$ ) provided by Chester LabNet. These values were then divided by the average volumes collected throughout the Helena  $\text{PM}_{2.5}$  quartz filter sampling program ( $24.03 \text{ m}^3$ ). The quartz filter field blank results for ions, OC, and EC are presented in Tables 9 and 10.

**Table 8: Average Field Blank Concentrations of  $\text{PM}_{2.5}$  Mass and Elements.**

Analyte	Concentration ( $\mu\text{g}/\text{m}^3$ )	MDL ( $\mu\text{g}/\text{m}^3$ )	Analyte	Concentration ( $\mu\text{g}/\text{m}^3$ )	MDL ( $\mu\text{g}/\text{m}^3$ )
Mass	*	0.630			
Sodium	0.004	0.074	Germanium	0.000	0.001
Magnesium	0.001	0.019	Arsenic	0.000	0.002
Aluminum	0.001	0.015	Selenium	0.000	0.001
Silicon	0.000	0.020	Bromine	0.000	0.001
Phosphorus	0.000	0.003	Rubidium	0.000	0.001
Sulfur	0.000	0.029	Strontium	0.000	0.001
Chlorine	0.001	0.009	Yttrium	0.000	0.002
Potassium	0.000	0.013	Zirconium	0.000	0.002
Calcium	0.000	0.009	Molybdenum	0.000	0.003
Titanium	<b>0.001</b>	0.001	Palladium	0.000	0.007
Vanadium	0.000	0.001	Silver	0.001	0.007
Chromium	0.000	0.001	Cadmium	0.000	0.008
Manganese	0.000	0.002	Indium	0.001	0.008
Iron	0.000	0.007	Tin	0.002	0.010
Cobalt	0.000	0.004	Antimony	0.002	0.010
Nickel	0.001	0.002	Barium	0.003	0.005
Copper	0.001	0.002	Lanthanum	0.001	0.004
Zinc	0.000	0.004	Mercury	0.001	0.002
Gallium	<b>0.001</b>	0.001	Lead	0.002	0.003

Note: Bolded values indicate blank concentrations measured at or above the MDL. \*UM-CEHS does not have this information.

**Table 9: Average Field Blank Concentrations of Ions.**

Analyte	Concentration ( $\mu\text{g}/\text{m}^3$ )	MDL ( $\mu\text{g}/\text{m}^3$ )
Sulfate	<b>0.105</b>	0.062
Nitrate	0.000	0.062
Ammonium	0.000	0.062
Chloride	0.000	0.062
Potassium	0.000	0.062
Fluoride	<b>0.090</b>	0.062
Sodium	<b>2.014</b>	0.125
Calcium	<b>0.429</b>	0.010
Magnesium	<b>0.055</b>	0.002

Note: Bolded values indicate blank concentrations measured above the MDL.

**Table 10: Average Field Blank Concentrations of Elemental and Organic Carbon.**

Analyte	Concentration ( $\mu\text{g}/\text{m}^3$ )	MDL ( $\mu\text{g}/\text{m}^3$ )
<b>Total Carbon</b>	0.285	0.230
<b>Organic Carbon</b>	0.285	0.229
<b>Elemental Carbon</b>	0.000	0.001

The results of the PM<sub>2.5</sub> speciation field blank analyses show that the Teflon filters did not measure significant artifacts for elements. From the quartz filter blanks, there were elevated concentrations of OC artifact detected above the calculated MDL. This was also the case for several ions measured from the quartz filter blanks, including sulfate, fluoride, sodium, calcium, and magnesium. Care was taken when utilizing these ions as fitting species to avoid inaccurate source apportionment to the fine PM.

### 7.6 CMB Program QA/QC

EPA's validation protocol (Watson et al., 2004) was followed throughout this CMB modeling program to ensure accurate results. For each model run, several different combinations of source profiles were evaluated, and the number of chemical species always exceeded the number of source types. The source contribution estimates and the statistics and diagnostic information were reviewed for each model run to determine the validity of the initial model results. The analysis was repeated by eliminating source profiles that gave negative source contribution estimates or standard errors that exceeded the source contribution estimates. When conducting the CMB model runs, only sources with TSTATs >2 were reported. If a TSTAT was <2, then the source was not considered a significant contributor for that sample day.

The majority of the CMB fitting parameters used to evaluate the validity of source contribution estimates were well within EPA target ranges. The one exception was the 1/31/08 (mass = 3.7  $\mu\text{g}/\text{m}^3$ ) sample day, as it was very difficult to find a good fit for this data set. Even though the  $r^2$  and  $\text{chi}^2$  were well within the desired range, the % mass was 132.9%. Table 11 presents the program average key 'goodness-of-fit' statistics commonly evaluated for CMB models, the results for the Helena CMB runs, and the EPA target ranges for each parameter. The values for  $R^2$ ,  $\text{Chi}^2$ , DF, and % mass explained for each CMB model run were generally well within the EPA target ranges. For the most part, the R/U ratios for fitting species were all less than 2, and source collinearity (similarities between identified sources) was not a problem throughout this modeling application.

**Table 11: Average Goodness-Of-Fit Parameters for the 2007/2008 Helena CMB.**

Goodness-of-Fit Parameter	Helena CMB	EPA Target
$R^2$	0.96	0.8 - 1.00
$\text{Chi}^2$	0.28	0.00 - 4.0
Degrees of Freedom	35	> 5
% Mass Explained	103.9	80 - 120%
TSTAT	>2	>2

It is believed that all of the PM<sub>2.5</sub> emission sources (or at least the source types) were identified during the 2007/2008 Helena CMB modeling program. Missing source types are identified by a low percent mass explained (<80%) and/or a RATIO R/U <<-2.0 for chemical species which are in the missing source. In addition, a “high negative” residual for one or more species and a large Chi<sup>2</sup> can be indicative of missing sources. The good agreement between the calculated source contributions and the measured ambient concentrations indicate that all of the major source types were included in the calculations, and that ambient and source profile measurements are reasonably accurate.

CMB is intended to complement rather than replace other data analysis and modeling methods. For this project, the sensitivity of the CMB model’s results to the errors in the source profiles were evaluated by using different chemical abundances of a source type and by changing the fitting species used in the source type. The results of the sensitivity tests for each run showed that the CMB calculations carried out in this study were acceptable. Although there were a few cases where the fitting parameters were outside the EPA target range, none of these cases were considered invalid, and all of the fits were quite strong. Therefore, the source contribution estimates identified in this project can be considered valid.

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**Appendix A: Source Contribution Estimates and Associated Standard Errors ( $\mu\text{g}/\text{m}^3$ ) for Each Sample Day.**

Date	PM <sub>2.5</sub> Mass	Street Sand	Street Sand STD ERR	Sulfate	Sulfate STD ERR	Ammonium Nitrate	Ammonium Nitrate STD ERR	Autos	Autos STD ERR	Diesel	Diesel STD ERR	Cement Kiln	Cement Kiln ERR	Wood Smoke	Wood Smoke STD ERR
11/2/2007	9.0	0.9	0.3	0.7	0.1	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	6.5	1.6
11/8/2007	11.8	1.9	0.5	0.9	0.1	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	8.1	2.0
11/14/2007	4.8	0.4	0.1	0.3	0.0	0.4	0.0	0.8	0.4	0.0	0.0	0.0	0.0	3.1	0.5
11/20/2007	17.9	0.0	0.0	1.5	0.2	2.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	14.4	2.9
11/26/2007	13.8	0.0	0.0	0.3	0.1	2.0	0.1	0.0	0.0	0.0	0.0	0.6	0.2	11.1	2.7
12/2/2007	9.7	0.0	0.0	0.8	0.1	2.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	6.4	1.6
12/8/2007	5.6	0.2	0.1	0.2	0.0	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.5
12/14/2007	6.9	0.5	0.1	0.1	0.0	0.6	0.0	1.6	0.5	0.0	0.0	0.5	0.2	3.7	0.6
12/20/2007	2.8	0.1	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.3
12/26/2007	3.0	0.1	0.0	0.1	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.3
1/1/2008	4.6	0.3	0.1	0.3	0.0	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.5
1/7/2008	10.1	0.0	0.0	0.2	0.0	1.0	0.1	0.0	0.0	0.6	0.2	0.0	0.0	8.4	1.0
1/13/2008	2.7	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.4
1/19/2008	10.3	0.0	0.0	0.5	0.1	3.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	6.2	1.6
1/25/2008	46.0	0.0	0.0	1.6	0.2	16.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	28.6	7.2
1/31/2008	3.7	0.1	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.5
2/6/2008	2.4	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.3
2/12/2008	4.0	0.2	0.0	0.1	0.0	0.3	0.0	1.2	0.4	0.0	0.0	0.0	0.0	2.4	0.5
2/18/2008	8.8	0.5	0.1	0.3	0.0	1.2	0.1	1.2	0.6	0.0	0.0	0.0	0.0	5.4	0.8
2/24/2008	8.5	0.0	0.0	1.1	0.1	3.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.9
3/1/2008	2.6	0.3	0.1	0.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.3
<b>Average</b>	<b>9.0</b>	<b>0.3</b>	<b>0.1</b>	<b>0.5</b>	<b>0.1</b>	<b>1.8</b>	<b>0.1</b>	<b>0.2</b>	<b>0.1</b>	<b>0.03</b>	<b>0.01</b>	<b>0.05</b>	<b>0.02</b>	<b>6.3</b>	<b>1.3</b>

## Appendix B: Helena CMB Input Files (Ambient and Source Profiles)

TMAC	TOT	Mass by gravimetry (ug/m3)		C42	MO	Molybdenum by XRF (ug/m3)
C12	MG	Magnesium by XRF (ug/m3)		C46	PD	Palladium by XRF (ug/m3)
C13	AL	Aluminum by XRF (ug/m3)		C47	AG	Silver by XRF (ug/m3)
C14	SI	Silicon by XRF (ug/m3)		C48	CD	Cadmium by XRF (ug/m3)
C15	P	Phosphorus by XRF (ug/m3)		C49	IN	Indium by XRF (ug/m3)
C16	S	Sulfur by XRF (ug/m3)		C50	SN	Tin by XRF (ug/m3)
C17	CL	Chlorine by XRF (ug/m3)		C51	SB	Antimony by XRF (ug/m3)
C19	K	Potassium by XRF (ug/m3)		C56	BA	Barium by XRF (ug/m3)
C20	CA	Calcium by XRF (ug/m3)		C57	LA	Lanthanum by XRF (ug/m3)
C22	TI	Titanium by XRF (ug/m3)		C80	HG	Mercury by XRF (ug/m3)
C23	V	Vanadium by XRF (ug/m3)		C82	PB	Lead by XRF (ug/m3)
C24	CR	Chromium by XRF (ug/m3)		C200	TC	Total Carbon by TOR (ug/m3)
C25	MN	Manganese by XRF (ug/m3)		C201	OC	Organic Carbon by TOR (ug/m3)
C26	FE	Iron by XRF (ug/m3)		C202	EC	Elemental Carbon by TOR (ug/m3)
C28	NI	Nickel by XRF (ug/m3)		C203	SO4	Sulfate by IC (ug/m3)
C29	CU	Copper by XRF (ug/m3)		C204	NO3	Nitrate by IC (ug/m3)
C30	ZN	Zinc by XRF (ug/m3)		C205	NH4	Ammonia by IC (ug/m3)
C31	GA	Gallium by XRF (ug/m3)		C217	CL2	Chloride by IC (ug/m3)
C32	GE	Germanium by XRF (ug/m3)		C219	K2	Potassium by IC (ug/m3)
C33	AS	Arsenic by XRF (ug/m3)		C300	F2	Fluoride by IC (ug/m3)
C34	SE	Selenium by XRF (ug/m3)		C301	NA2	Sodium by IC (ug/m3)
C35	BR	Bromine by XRF (ug/m3)		C302	CA2	Calcium by ICP (ug/m3)
C37	RB	Rubidium by XRF (ug/m3)		C303	MG2	Magnesium by ICP (ug/m3)
C38	SR	Strontium by XRF (ug/m3)		C304	NA	Sodium by XRF (ug/m3)
C39	Y	Yttrium by XRF (ug/m3)		C305	CO	Cobalt by XRF (ug/m3)
C40	ZR	Zirconium by XRF (ug/m3)				



### Helena Ambient PM<sub>2.5</sub> Speciation Data

ID	Date	Dur	STHOUR	Size	TMAC	TMAU	C12	MG	C13	AL
HELENA	11/2/2007	24	0	FINE	9	0.0001	0.0028	0.0064	0.0664	0.0067
HELENA	11/8/2007	24	0	FINE	11.8	0.0001	0.0316	0.0125	0.1385	0.0108
HELENA	11/14/2007	24	0	FINE	4.8	0.0001	0.0074	0.0058	0.0403	0.0053
HELENA	11/20/2007	24	0	FINE	17.9	0.0001	0.0000	0.0064	0.0188	0.0047
HELENA	11/26/2007	24	0	FINE	13.8	0.0001	0.0063	0.0060	0.0092	0.0043
HELENA	12/2/2007	24	0	FINE	9.7	0.0001	0.0028	0.0056	0.0149	0.0043
HELENA	12/8/2007	24	0	FINE	5.6	0.0001	0.0000	0.0056	0.0222	0.0045
HELENA	12/14/2007	24	0	FINE	6.9	0.0001	0.0000	0.0061	0.0417	0.0054
HELENA	12/20/2007	24	0	FINE	2.8	0.0001	0.0000	0.0053	0.0170	0.0041
HELENA	12/26/2007	24	0	FINE	3	0.0001	0.0192	0.0098	0.0202	0.0047
HELENA	1/1/2008	24	0	FINE	4.6	0.0001	0.0200	0.0102	0.0355	0.0056
HELENA	1/7/2008	24	0	FINE	10.1	0.0001	0.0000	0.0054	0.0073	0.0044
HELENA	1/13/2008	24	0	FINE	2.7	0.0001	0.0000	0.0049	0.0034	0.0028
HELENA	1/19/2008	24	0	FINE	10.3	0.0001	0.0000	0.0057	0.0035	0.0029
HELENA	1/25/2008	24	0	FINE	46	0.0001	0.0000	0.0083	0.0024	0.0039
HELENA	1/31/2008	24	0	FINE	3.7	0.0001	0.0024	0.0051	0.0160	0.0039
HELENA	2/6/2008	24	0	FINE	2.4	0.0001	0.0000	0.0052	0.0071	0.0036
HELENA	2/12/2008	24	0	FINE	4	0.0001	0.0000	0.0054	0.0188	0.0041
HELENA	2/18/2008	24	0	FINE	8.8	0.0001	0.0054	0.0060	0.0296	0.0049
HELENA	2/24/2008	24	0	FINE	8.5	0.0001	0.0103	0.0059	0.0151	0.0041
HELENA	3/1/2008	24	0	FINE	2.6	0.0001	0.0053	0.0057	0.0336	0.0049

Date	C14	SI	C15	P	C16	S	C17	CL	C19	K
0.1932	0.0109	0.0036	0.0013	0.2416	0.0138	0.0043	0.0021	0.0702	0.0041	0.1932
0.3529	0.0192	0.0000	0.0014	0.3248	0.0180	0.0000	0.0024	0.1173	0.0064	0.3529
0.1138	0.0068	0.0000	0.0010	0.1068	0.0071	0.0125	0.0022	0.0520	0.0032	0.1138
0.0514	0.0040	0.0002	0.0016	0.5418	0.0289	0.0286	0.0032	0.0852	0.0048	0.0514
0.0650	0.0045	0.0067	0.0013	0.1596	0.0099	0.0195	0.0027	0.0862	0.0049	0.0650
0.0487	0.0037	0.0016	0.0012	0.2799	0.0157	0.0000	0.0022	0.0938	0.0053	0.0487
0.0739	0.0049	0.0015	0.0011	0.0915	0.0065	0.0055	0.0021	0.0368	0.0025	0.0739
0.1253	0.0074	0.0061	0.0012	0.0856	0.0063	0.0147	0.0024	0.0464	0.0030	0.1253
0.0603	0.0042	0.0009	0.0010	0.0350	0.0040	0.0046	0.0020	0.0246	0.0019	0.0603
0.0518	0.0043	0.0058	0.0013	0.0386	0.0044	0.0229	0.0026	0.0252	0.0020	0.0518
0.0774	0.0056	0.0056	0.0012	0.0916	0.0062	0.0197	0.0026	0.2247	0.0117	0.0774
0.0351	0.0035	0.0146	0.0016	0.0695	0.0064	0.0449	0.0035	0.0803	0.0046	0.0351
0.0277	0.0031	0.0017	0.0010	0.0353	0.0042	0.0060	0.0019	0.0153	0.0015	0.0277
0.0539	0.0073	0.0000	0.0012	0.1681	0.0102	0.0162	0.0025	0.0381	0.0025	0.0539
0.0370	0.0030	0.0000	0.0019	0.5869	0.0315	0.0990	0.0065	0.1555	0.0084	0.0370
0.0333	0.0029	0.0000	0.0009	0.0413	0.0041	0.0098	0.0020	0.0201	0.0016	0.0333
0.0164	0.0022	0.0026	0.0010	0.0352	0.0040	0.0298	0.0029	0.0110	0.0014	0.0164
0.0375	0.0031	0.0013	0.0010	0.0357	0.0041	0.0113	0.0023	0.0238	0.0019	0.0375
0.0943	0.0060	0.0039	0.0013	0.1121	0.0076	0.0136	0.0026	0.0547	0.0034	0.0943
0.0316	0.0030	0.0012	0.0014	0.3715	0.0202	0.0084	0.0024	0.0248	0.0019	0.0316
0.0954	0.0059	0.0010	0.0011	0.0853	0.0063	0.0010	0.0021	0.0198	0.0017	0.0954

### Helena Ambient PM<sub>2.5</sub> Speciation Data, cont.

Date	C20	CA	C22	TI	C23	V	C24	CR	C25	MN
11/2/2007	0.0705	0.0100	0.0047	0.0006	0.0000	0.0003	0.0002	0.0004	0.0026	0.0006
11/8/2007	0.1449	0.0125	0.0087	0.0008	0.0000	0.0004	0.0000	0.0005	0.0022	0.0008
11/14/2007	0.0447	0.0087	0.0031	0.0005	0.0000	0.0003	0.0000	0.0004	0.0005	0.0006
11/20/2007	0.0315	0.0104	0.0023	0.0005	0.0000	0.0003	0.0000	0.0005	0.0019	0.0006
11/26/2007	0.0383	0.0104	0.0033	0.0005	0.0000	0.0003	0.0000	0.0005	0.0000	0.0006
12/2/2007	0.0191	0.0117	0.0014	0.0004	0.0001	0.0003	0.0000	0.0004	0.0015	0.0006
12/8/2007	0.0327	0.0078	0.0030	0.0005	0.0000	0.0004	0.0002	0.0005	0.0007	0.0006
12/14/2007	0.0679	0.0096	0.0037	0.0005	0.0002	0.0003	0.0000	0.0004	0.0002	0.0006
12/20/2007	0.0312	0.0078	0.0032	0.0005	0.0000	0.0003	0.0000	0.0004	0.0006	0.0006
12/26/2007	0.0297	0.0021	0.0025	0.0005	0.0007	0.0003	0.0012	0.0004	0.0021	0.0006
1/1/2008	0.0470	0.0027	0.0000	0.0006	0.0000	0.0004	0.0000	0.0004	0.0010	0.0006
1/7/2008	0.0438	0.0025	0.0049	0.0006	0.0000	0.0004	0.0000	0.0004	0.0018	0.0006
1/13/2008	0.0169	0.0013	0.0014	0.0004	0.0006	0.0003	0.0001	0.0004	0.0000	0.0006
1/19/2008	0.0137	0.0012	0.0019	0.0005	0.0009	0.0003	0.0000	0.0005	0.0005	0.0006
1/25/2008	0.0464	0.0031	0.0002	0.0006	0.0000	0.0003	0.0002	0.0005	0.0030	0.0007
1/31/2008	0.0148	0.0012	0.0000	0.0004	0.0000	0.0003	0.0000	0.0004	0.0000	0.0006
2/6/2008	0.0098	0.0010	0.0000	0.0005	0.0000	0.0003	0.0005	0.0005	0.0000	0.0007
2/12/2008	0.0263	0.0017	0.0022	0.0005	0.0000	0.0003	0.0000	0.0005	0.0014	0.0006
2/18/2008	0.0305	0.0020	0.0039	0.0006	0.0000	0.0004	0.0000	0.0005	0.0004	0.0007
2/24/2008	0.0133	0.0012	0.0013	0.0005	0.0008	0.0003	0.0000	0.0005	0.0003	0.0007
3/1/2008	0.0393	0.0024	0.0028	0.0005	0.0000	0.0003	0.0006	0.0005	0.0009	0.0006

Date	C26	FE	C28	NI	C29	CU	C30	ZN	C31	GA
11/2/2007	0.0851	0.0045	0.0005	0.0007	0.0066	0.0008	0.0146	0.0010	0.0005	0.0004
11/8/2007	0.1206	0.0063	0.0000	0.0008	0.0214	0.0015	0.0243	0.0016	0.0000	0.0005
11/14/2007	0.0755	0.0040	0.0017	0.0007	0.0052	0.0008	0.0123	0.0009	0.0000	0.0004
11/20/2007	0.0403	0.0023	0.0006	0.0007	0.0238	0.0016	0.0311	0.0018	0.0000	0.0005
11/26/2007	0.0526	0.0029	0.0015	0.0007	0.0065	0.0008	0.0297	0.0017	0.0000	0.0005
12/2/2007	0.0199	0.0015	0.0024	0.0007	0.0019	0.0007	0.0147	0.0010	0.0010	0.0005
12/8/2007	0.0290	0.0018	0.0017	0.0007	0.0020	0.0007	0.0099	0.0008	0.0001	0.0005
12/14/2007	0.0610	0.0033	0.0017	0.0007	0.0068	0.0008	0.0269	0.0016	0.0000	0.0005
12/20/2007	0.0606	0.0033	0.0020	0.0007	0.0058	0.0008	0.0145	0.0010	0.0000	0.0005
12/26/2007	0.0341	0.0020	0.0008	0.0011	0.0023	0.0009	0.0178	0.0015	0.0016	0.0006
1/1/2008	0.0398	0.0023	0.0003	0.0010	0.0022	0.0008	0.0138	0.0013	0.0002	0.0006
1/7/2008	0.0756	0.0040	0.0012	0.0010	0.0075	0.0011	0.0408	0.0026	0.0008	0.0006
1/13/2008	0.0175	0.0013	0.0004	0.0010	0.0016	0.0009	0.0047	0.0009	0.0000	0.0006
1/19/2008	0.0188	0.0015	0.0034	0.0007	0.0044	0.0008	0.0076	0.0008	0.0005	0.0005
1/25/2008	0.0726	0.0039	0.0159	0.0012	0.0626	0.0053	0.1088	0.0084	0.0000	0.0005
1/31/2008	0.0177	0.0022	0.0025	0.0007	0.0022	0.0007	0.0101	0.0008	0.0007	0.0004
2/6/2008	0.0063	0.0011	0.0005	0.0007	0.0009	0.0007	0.0068	0.0008	0.0005	0.0005
2/12/2008	0.0400	0.0023	0.0015	0.0008	0.0238	0.0016	0.0126	0.0010	0.0000	0.0005
2/18/2008	0.0457	0.0026	0.0032	0.0008	0.0091	0.0009	0.0267	0.0016	0.0008	0.0005
2/24/2008	0.0232	0.0026	0.0021	0.0007	0.0036	0.0008	0.0092	0.0008	0.0002	0.0005
3/1/2008	0.0369	0.0022	0.0036	0.0008	0.0027	0.0007	0.0078	0.0008	0.0003	0.0005

**Helena Ambient PM<sub>2.5</sub> Speciation Data, cont.**

Date	C32	GE	C33	AS	C34	SE	C35	BR	C37	RB
11/2/2007	0.0005	0.0004	0.0000	0.0008	0.0000	0.0003	0.0031	0.0003	0.0001	0.0003
11/8/2007	0.0000	0.0005	0.0003	0.0008	0.0007	0.0004	0.0028	0.0004	0.0003	0.0004
11/14/2007	0.0000	0.0004	0.0011	0.0006	0.0005	0.0003	0.0014	0.0003	0.0000	0.0003
11/20/2007	0.0000	0.0004	0.0000	0.0009	0.0000	0.0003	0.0031	0.0004	0.0003	0.0003
11/26/2007	0.0010	0.0004	0.0011	0.0007	0.0000	0.0003	0.0021	0.0003	0.0004	0.0003
12/2/2007	0.0005	0.0004	0.0007	0.0006	0.0003	0.0003	0.0014	0.0003	0.0002	0.0003
12/8/2007	0.0000	0.0004	0.0004	0.0007	0.0000	0.0003	0.0013	0.0003	0.0000	0.0003
12/14/2007	0.0000	0.0004	0.0000	0.0007	0.0000	0.0003	0.0015	0.0003	0.0009	0.0003
12/20/2007	0.0004	0.0004	0.0000	0.0006	0.0004	0.0003	0.0007	0.0003	0.0001	0.0003
12/26/2007	0.0005	0.0005	0.0000	0.0008	0.0000	0.0004	0.0029	0.0005	0.0003	0.0005
1/1/2008	0.0008	0.0005	0.0000	0.0008	0.0008	0.0004	0.0017	0.0004	0.0000	0.0005
1/7/2008	0.0006	0.0005	0.0012	0.0005	0.0005	0.0004	0.0022	0.0005	0.0010	0.0005
1/13/2008	0.0005	0.0005	0.0000	0.0008	0.0000	0.0004	0.0002	0.0004	0.0000	0.0005
1/19/2008	0.0004	0.0004	0.0007	0.0007	0.0004	0.0003	0.0009	0.0003	0.0001	0.0003
1/25/2008	0.0000	0.0004	0.0002	0.0012	0.0001	0.0004	0.0066	0.0005	0.0004	0.0004
1/31/2008	0.0000	0.0004	0.0000	0.0006	0.0000	0.0003	0.0009	0.0003	0.0001	0.0003
2/6/2008	0.0001	0.0004	0.0004	0.0007	0.0007	0.0004	0.0008	0.0003	0.0000	0.0004
2/12/2008	0.0000	0.0004	0.0005	0.0008	0.0011	0.0004	0.0009	0.0003	0.0000	0.0003
2/18/2008	0.0005	0.0004	0.0005	0.0008	0.0002	0.0004	0.0022	0.0003	0.0000	0.0004
2/24/2008	0.0004	0.0004	0.0006	0.0007	0.0004	0.0004	0.0013	0.0003	0.0001	0.0004
3/1/2008	0.0003	0.0004	0.0002	0.0007	0.0001	0.0003	0.0009	0.0003	0.0007	0.0003

Date	C38	SR	C39	Y	C40	ZR	C42	MO	C46	PD
11/2/2007	0.0006	0.0003	0.0000	0.0004	0.0005	0.0006	0.0008	0.0008	0.0000	0.0026
11/8/2007	0.0003	0.0005	0.0006	0.0006	0.0020	0.0007	0.0000	0.0010	0.0000	0.0028
11/14/2007	0.0000	0.0004	0.0000	0.0005	0.0003	0.0006	0.0000	0.0008	0.0023	0.0027
11/20/2007	0.0002	0.0004	0.0000	0.0005	0.0000	0.0006	0.0000	0.0008	0.0000	0.0026
11/26/2007	0.0000	0.0004	0.0000	0.0005	0.0004	0.0006	0.0005	0.0008	0.0001	0.0027
12/2/2007	0.0000	0.0004	0.0000	0.0005	0.0010	0.0006	0.0007	0.0009	0.0000	0.0027
12/8/2007	0.0005	0.0004	0.0004	0.0005	0.0011	0.0006	0.0000	0.0009	0.0016	0.0027
12/14/2007	0.0004	0.0004	0.0002	0.0005	0.0001	0.0006	0.0002	0.0009	0.0007	0.0028
12/20/2007	0.0000	0.0004	0.0000	0.0005	0.0003	0.0006	0.0001	0.0009	0.0000	0.0027
12/26/2007	0.0011	0.0007	0.0000	0.0008	0.0000	0.0010	0.0000	0.0015	0.0000	0.0024
1/1/2008	0.0014	0.0007	0.0000	0.0008	0.0000	0.0010	0.0016	0.0014	0.0000	0.0024
1/7/2008	0.0011	0.0007	0.0000	0.0008	0.0017	0.0010	0.0000	0.0015	0.0000	0.0023
1/13/2008	0.0004	0.0006	0.0000	0.0008	0.0001	0.0010	0.0000	0.0014	0.0000	0.0023
1/19/2008	0.0005	0.0004	0.0005	0.0005	0.0000	0.0006	0.0000	0.0009	0.0012	0.0027
1/25/2008	0.0008	0.0004	0.0000	0.0005	0.0009	0.0006	0.0027	0.0009	0.0002	0.0027
1/31/2008	0.0000	0.0003	0.0004	0.0005	0.0008	0.0006	0.0006	0.0008	0.0001	0.0026
2/6/2008	0.0000	0.0004	0.0000	0.0005	0.0000	0.0007	0.0000	0.0010	0.0024	0.0027
2/12/2008	0.0004	0.0004	0.0003	0.0005	0.0000	0.0006	0.0000	0.0009	0.0000	0.0027
2/18/2008	0.0002	0.0004	0.0000	0.0005	0.0000	0.0007	0.0007	0.0010	0.0000	0.0028
2/24/2008	0.0002	0.0004	0.0000	0.0005	0.0000	0.0006	0.0000	0.0009	0.0000	0.0027
3/1/2008	0.0001	0.0004	0.0000	0.0005	0.0005	0.0006	0.0000	0.0009	0.0000	0.0028

**Helena Ambient PM<sub>2.5</sub> Speciation Data, cont.**

Date	C47	AG	C48	CD	C49	IN	C50	SN	C51	SB
11/2/2007	0.0000	0.0028	0.0000	0.0028	0.0000	0.0031	0.0000	0.0035	0.0000	0.0037
11/8/2007	0.0000	0.0029	0.0000	0.0031	0.0068	0.0034	0.0000	0.0037	0.0000	0.0041
11/14/2007	0.0032	0.0028	0.0019	0.0028	0.0000	0.0031	0.0000	0.0034	0.0008	0.0038
11/20/2007	0.0021	0.0028	0.0000	0.0028	0.0009	0.0031	0.0040	0.0035	0.0000	0.0038
11/26/2007	0.0016	0.0028	0.0000	0.0029	0.0000	0.0031	0.0018	0.0035	0.0000	0.0038
12/2/2007	0.0000	0.0028	0.0023	0.0029	0.0000	0.0032	0.0000	0.0036	0.0000	0.0039
12/8/2007	0.0000	0.0028	0.0018	0.0029	0.0009	0.0032	0.0025	0.0036	0.0000	0.0039
12/14/2007	0.0030	0.0028	0.0000	0.0029	0.0000	0.0031	0.0055	0.0036	0.0000	0.0039
12/20/2007	0.0000	0.0028	0.0013	0.0029	0.0000	0.0031	0.0010	0.0035	0.0034	0.0039
12/26/2007	0.0000	0.0024	0.0000	0.0023	0.0000	0.0027	0.0023	0.0035	0.0059	0.0037
1/1/2008	0.0012	0.0025	0.0000	0.0025	0.0018	0.0028	0.0000	0.0034	0.0000	0.0036
1/7/2008	0.0023	0.0024	0.0054	0.0025	0.0000	0.0027	0.0002	0.0034	0.0000	0.0035
1/13/2008	0.0000	0.0024	0.0000	0.0024	0.0000	0.0027	0.0000	0.0033	0.0042	0.0035
1/19/2008	0.0009	0.0028	0.0019	0.0030	0.0019	0.0032	0.0000	0.0036	0.0000	0.0039
1/25/2008	0.0000	0.0028	0.0000	0.0030	0.0052	0.0032	0.0074	0.0036	0.0001	0.0039
1/31/2008	0.0000	0.0028	0.0000	0.0029	0.0000	0.0031	0.0014	0.0035	0.0000	0.0038
2/6/2008	0.0038	0.0029	0.0000	0.0031	0.0000	0.0033	0.0019	0.0036	0.0000	0.0040
2/12/2008	0.0000	0.0029	0.0000	0.0031	0.0000	0.0033	0.0005	0.0037	0.0000	0.0040
2/18/2008	0.0006	0.0029	0.0034	0.0031	0.0012	0.0033	0.0000	0.0037	0.0000	0.0040
2/24/2008	0.0000	0.0028	0.0034	0.0031	0.0000	0.0033	0.0024	0.0037	0.0044	0.0040
3/1/2008	0.0017	0.0029	0.0025	0.0031	0.0000	0.0033	0.0000	0.0036	0.0022	0.0040

Date	C56	BA	C57	LA	C80	HG	C82	PB	C200	TC
11/2/2007	0.0000	0.0016	0.0000	0.0011	0.0001	0.0007	0.0071	0.0011	5.3933	0.4191
11/8/2007	0.0031	0.0019	0.0000	0.0015	0.0000	0.0008	0.0067	0.0012	5.8926	0.4444
11/14/2007	0.0011	0.0015	0.0000	0.0010	0.0000	0.0007	0.0017	0.0010	3.1309	0.3061
11/20/2007	0.0000	0.0016	0.0000	0.0010	0.0006	0.0008	0.0124	0.0013	9.9376	0.6442
11/26/2007	0.0003	0.0016	0.0011	0.0011	0.0017	0.0007	0.0045	0.0010	8.5429	0.5745
12/2/2007	0.0025	0.0015	0.0000	0.0009	0.0003	0.0007	0.0016	0.0010	4.8293	0.3917
12/8/2007	0.0006	0.0016	0.0000	0.0011	0.0003	0.0008	0.0013	0.0010	3.6320	0.3317
12/14/2007	0.0020	0.0016	0.0019	0.0011	0.0000	0.0008	0.0045	0.0011	4.3256	0.3662
12/20/2007	0.0021	0.0015	0.0000	0.0010	0.0007	0.0007	0.0023	0.0010	2.6228	0.2813
12/26/2007	0.0036	0.0017	0.0010	0.0016	0.0021	0.0011	0.0045	0.0014	2.3770	0.2687
1/1/2008	0.0101	0.0019	0.0000	0.0016	0.0015	0.0011	0.0039	0.0013	2.9875	0.2993
1/7/2008	0.0051	0.0020	0.0000	0.0018	0.0014	0.0011	0.0024	0.0013	7.6404	0.5343
1/13/2008	0.0053	0.0017	0.0000	0.0015	0.0000	0.0011	0.0040	0.0013	1.5131	0.2252
1/19/2008	0.0019	0.0014	0.0014	0.0009	0.0005	0.0008	0.0014	0.0010	4.8148	0.3905
1/25/2008	0.0066	0.0016	0.0008	0.0011	0.0000	0.0008	0.0168	0.0016	17.6853	1.0341
1/31/2008	0.0026	0.0015	0.0004	0.0009	0.0000	0.0007	0.0015	0.0009	3.6669	0.3332
2/6/2008	0.0000	0.0017	0.0000	0.0011	0.0008	0.0008	0.0022	0.0010	2.2731	0.2633
2/12/2008	0.0043	0.0016	0.0000	0.0010	0.0001	0.0008	0.0064	0.0012	2.7757	0.2886
2/18/2008	0.0022	0.0017	0.0000	0.0011	0.0001	0.0008	0.0047	0.0012	5.4432	0.4228
2/24/2008	0.0013	0.0016	0.0012	0.0010	0.0007	0.0008	0.0027	0.0011	2.7577	0.2878
3/1/2008	0.0014	0.0016	0.0000	0.0011	0.0004	0.0008	0.0036	0.0011	1.3134	0.2157

### Helena Ambient PM<sub>2.5</sub> Speciation Data, cont.

Date	C201	OC	C202	EC	C203	SO4	C204	NO3	C205	NH4
11/2/2007	4.8856	0.3441	0.4994	0.1248	0.7948	0.0398	0.5119	0.0256	0.3096	0.0155
11/8/2007	4.8856	0.3441	1.0087	0.1503	1.1819	0.0591	0.5909	0.0296	0.4286	0.0215
11/14/2007	2.7919	0.2393	0.3370	0.1167	0.3627	0.0181	0.3378	0.0169	0.0997	0.0050
11/20/2007	9.0886	0.5543	0.8439	0.1418	1.8685	0.0936	1.4482	0.0724	0.8989	0.0449
11/26/2007	7.4438	0.4725	1.0691	0.1534	0.6078	0.0305	1.5071	0.0754	0.5079	0.0254
12/2/2007	4.5129	0.3252	0.3217	0.1159	0.8993	0.0450	1.7818	0.0891	0.6411	0.0321
12/8/2007	3.4521	0.2728	0.1808	0.1089	0.4413	0.0221	0.6911	0.0345	0.0812	0.0041
12/14/2007	3.8318	0.2918	0.4904	0.1244	0.4097	0.0205	0.4829	0.0241	0.0000	0.0624
12/20/2007	2.2931	0.2143	0.3327	0.1164	0.2635	0.0132	0.2498	0.0125	0.0000	0.0624
12/26/2007	2.1523	0.2072	0.2277	0.1114	0.2335	0.0117	0.2784	0.0139	0.0000	0.0624
1/1/2008	2.7727	0.2388	0.2118	0.1104	0.4246	0.0212	0.4580	0.0229	0.0000	0.0624
1/7/2008	6.9913	0.4503	0.6392	0.1318	0.3221	0.0161	0.8156	0.0408	0.0924	0.0046
1/13/2008	1.4332	0.1718	0.0764	0.1039	0.2335	0.0117	0.1024	0.0051	0.0000	0.0624
1/19/2008	4.5360	0.3266	0.2772	0.1139	0.6825	0.0342	3.0504	0.1527	0.6617	0.0331
1/25/2008	16.2864	0.9142	1.3888	0.1694	1.9775	0.0987	12.2398	0.6120	3.9759	0.1990
1/31/2008	3.5470	0.2773	0.1214	0.1059	0.2810	0.0141	0.2635	0.0132	0.0000	0.0624
2/6/2008	2.1832	0.2088	0.0899	0.1044	0.2173	0.0109	0.1549	0.0077	0.0000	0.0624
2/12/2008	2.5261	0.2262	0.2486	0.1123	0.2159	0.0108	0.2559	0.0128	0.0000	0.0624
2/18/2008	4.9938	0.3501	0.4628	0.1228	0.4911	0.0246	0.8947	0.0449	0.2921	0.0146
2/24/2008	2.5779	0.2288	0.1769	0.1089	1.1865	0.0591	2.5354	0.1266	0.9575	0.0479
3/1/2008	1.1985	0.1598	0.1149	0.1059	0.4032	0.0201	0.2697	0.0135	0.1049	0.0052

Date	C217	CL2	C219	K2	C300	F2	C301	NA2	C302	CA2
11/2/2007	0.0000	0.0624	0.0000	0.0624	0.0849	0.0042	0.4286	0.0213	0.3429	0.0171
11/8/2007	0.0000	0.0624	0.0899	0.0045	0.0762	0.0038	0.4661	0.0233	0.3700	0.0185
11/14/2007	0.0710	0.0036	0.0000	0.0623	0.0848	0.0042	0.4902	0.0244	0.3261	0.0163
11/20/2007	0.1049	0.0052	0.1011	0.0051	0.1086	0.0054	0.5909	0.0296	0.3991	0.0200
11/26/2007	0.0724	0.0036	0.0924	0.0046	0.1074	0.0054	0.5246	0.0262	0.4330	0.0216
12/2/2007	0.0000	0.0624	0.0874	0.0044	0.0837	0.0042	0.4913	0.0246	0.3597	0.0180
12/8/2007	0.3822	0.0191	0.5620	0.0281	0.3897	0.0195	2.8393	0.1420	0.6328	0.0317
12/14/2007	0.1886	0.0094	0.1898	0.0095	0.1536	0.0077	2.8809	0.1440	0.5787	0.0289
12/20/2007	0.0974	0.0049	0.0737	0.0037	0.1174	0.0059	2.6728	0.1336	0.5495	0.0274
12/26/2007	0.1211	0.0061	0.0774	0.0039	0.1074	0.0054	2.7882	0.1394	0.5077	0.0255
1/1/2008	0.0999	0.0050	0.1736	0.0087	0.1087	0.0054	2.6644	0.1332	0.5204	0.0260
1/7/2008	0.1423	0.0071	0.1223	0.0061	0.1311	0.0066	2.8548	0.1427	0.5035	0.0252
1/13/2008	0.1311	0.0066	0.1348	0.0067	0.1361	0.0068	2.5135	0.1257	0.4827	0.0241
1/19/2008	0.1036	0.0052	0.0999	0.0050	0.1149	0.0057	2.6883	0.1344	0.5160	0.0259
1/25/2008	0.2211	0.0111	0.1911	0.0096	0.1599	0.0080	2.6353	0.1320	0.5912	0.0296
1/31/2008	0.0874	0.0044	0.0000	0.0624	0.1037	0.0052	2.6436	0.1324	0.5246	0.0263
2/6/2008	0.0874	0.0044	0.0000	0.0624	0.0699	0.0035	0.4288	0.0214	0.2294	0.0115
2/12/2008	0.0674	0.0034	0.0000	0.0624	0.0674	0.0034	0.4659	0.0232	0.2421	0.0121
2/18/2008	0.0724	0.0036	0.0000	0.0624	0.0774	0.0039	0.4020	0.0201	0.2430	0.0122
2/24/2008	0.0624	0.0031	0.0000	0.0624	0.0674	0.0034	0.3772	0.0189	0.2469	0.0124
3/1/2008	0.0000	0.0624	0.0000	0.0624	0.0649	0.0032	0.4007	0.0201	0.3063	0.0153

**Helena Ambient PM<sub>2.5</sub> Speciation Data, cont.**

<b>Date</b>	<b>C303</b>	<b>MG2</b>	<b>C304</b>	<b>NA</b>	<b>C305</b>	<b>CO</b>
11/2/2007	0.0359	0.0018	0.0000	0.0186	0.0000	0.0014
11/8/2007	0.0387	0.0019	0.1203	0.0475	0.0000	0.0018
11/14/2007	0.0378	0.0019	0.0305	0.0384	0.0000	0.0014
11/20/2007	0.0504	0.0025	0.0379	0.0470	0.0000	0.0014
11/26/2007	0.0399	0.0020	0.0078	0.0413	0.0000	0.0014
12/2/2007	0.0361	0.0018	0.0572	0.0409	0.0000	0.0014
12/8/2007	0.0837	0.0042	0.0000	0.0175	0.0000	0.0015
12/14/2007	0.0745	0.0037	0.0000	0.0181	0.0000	0.0015
12/20/2007	0.0774	0.0039	0.0000	0.0163	0.0000	0.0015
12/26/2007	0.0691	0.0035	0.0504	0.0322	0.0000	0.0013
1/1/2008	0.0787	0.0040	0.0221	0.0134	0.0000	0.0013
1/7/2008	0.0653	0.0033	0.0124	0.0142	0.0000	0.0014
1/13/2008	0.0678	0.0034	0.0658	0.0294	0.0000	0.0012
1/19/2008	0.0662	0.0033	0.0000	0.0258	0.0000	0.0014
1/25/2008	0.0766	0.0038	0.0000	0.0268	0.0000	0.0016
1/31/2008	0.0666	0.0033	0.0084	0.0265	0.0000	0.0013
2/6/2008	0.0303	0.0015	0.0050	0.0280	0.0000	0.0015
2/12/2008	0.0312	0.0016	0.0000	0.0273	0.0000	0.0015
2/18/2008	0.0282	0.0014	0.0000	0.0139	0.0000	0.0016
2/24/2008	0.0272	0.0014	0.0053	0.0295	0.0000	0.0015
3/1/2008	0.0420	0.0021	0.0000	0.0273	0.0000	0.0015

### Helena PM<sub>2.5</sub> Source Profiles

PNO	SID	SIZE	C12	MG	C13	AL	C14	SI	C15	P
HAML01	ST_SANDF	FINE	0.001711	0.000172	0.086563	0.012623	0.215927	0.031127	0	0.000399
HAML02	ERN_RUSF	FINE	0.003032	0.000307	0.07822	0.011493	0.213167	0.030867	0	0.0004
HAML03	RUS_STF2	FINE	0.002852	0.000301	0.077316	0.011654	0.213645	0.031554	0	0.000463
HAML04	DESP_LTF	FINE	0.00099	0.0001	0.089841	0.01315	0.224711	0.032514	0	0.000404
HAML05	RDDST_BT	FINE	0	0.0001	0.1349	0.0135	0.3485	0.0349	0.0041	0.0004
HAML06	RDDST_CP	FINE	0.0084	0.0021	0.0792	0.0145	0.2148	0.0278	0.0011	0.0004
HAML07	RDDST_HE	FINE	0	0.0001	0.0882	0.0088	0.2633	0.0263	0.0029	0.0004
HAML08	RDDST_MS	FINE	0.01	0.0013	0.081	0.01	0.238	0.03	0	0.0001
HAML09	UNDST_CP	FINE	0	0.0001	0.1524	0.0154	0.3351	0.0337	0.0031	0.0003
HAML10	UNDST_HE	FINE	0	0.0001	0.1334	0.0133	0.3742	0.0374	0.0022	0.0003
HAML11	S04_FZER	FINE	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	FINE	0	0.00001	0	0.000001	0	0.00001	0	0.000001
HAML13	NH4NO3F2	FINE	0	0.00001	0	0.00001	0	0.00001	0	0.000001
HAML14	LDV_PBCF	FINE	0	0.1	0.00656	0.001312	0.01187	0.002374	0.00301	0.000602
HAML15	LDV_XPBF	FINE	0	0.1	0.00699	0.00281	0.03427	0.01755	0.00441	0.00164
HAML16	LDV_DSLF	FINE	0	0.1	0.00007	0.00004	0.00202	0.00177	0.00026	0.00015
HAML17	LDV_DS2F	FINE	0	0.1	0.00009	0.00007	0.00053	0.00028	0.00026	0.00008
HAML18	HDV_DSLF	FINE	0	0.1	0.00003	0.00026	0.00018	0.00018	0.00042	0.00009
HAML19	LDV_NCAT	FINE	0	0.0001	0.0073	0.0001	0.0039	0.0001	0.0048	0.0001
HAML20	LDV_WCAT	FINE	0	0.0001	0.0007	0.0001	0.0004	0.0001	0.0017	0.0001
HAML21	HDV_TRK1	FINE	0.009	0.0015	0.01	0.002	0.016	0.002	0.0015	0.0002
HAML22	HDV_TRK2	FINE	0	0.0001	0.0005	0.0001	0.0059	0.0001	0.0003	0.0001
HAML23	LDV_UNL1	FINE	0	0.0001	0.0012	0.0001	0.0051	0.0001	0	0.0001
HAML24	LDV_UNL2	FINE	0	0.0001	0.0015	0.0013	0.0624	0.0397	0.0004	0.0004
HAML25	GASEXST1	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML26	GASEXST2	FINE	0.002309	0.001365	0.002104	0.000937	0.007517	0.003151	0.004076	0.001365
HAML27	GASEXST3	FINE	0.002754	0.002177	0.001611	0.001473	0.005431	0.000742	0.002105	0.000254
HAML28	GASEXST4	FINE	0.000588	0.000477	0.00065	0.000417	0.003066	0.000703	0.001395	0.001362
HAML29	GASEXST5	FINE	0.000115	0.000151	0.000221	0.00006	0.003874	0.000058	0.000403	0.000032
HAML30	GASEXST6	FINE	0.001571	0.001008	0.001481	0.001049	0.005609	0.003284	0.002927	0.001898
HAML31	GASEXST7	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML32	GASEXST8	FINE	0	0.0001	0	0.0001	0	0.000487	0.000634	0.0001
HAML33	DESLXST1	FINE	0.000881	0.000891	0.0004	0.000957	0.005101	0.001284	0.000344	0.000349
HAML34	DESLXST2	FINE	0.000982	0.001039	0.000467	0.001159	0.005527	0.00143	0.000379	0.000392
HAML35	DESLXST3	FINE	0.000802	0.000782	0.000352	0.000815	0.004754	0.001208	0.000316	0.000315
HAML36	DESLXST4	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML37	DESLXST5	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML38	DESLXST6	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML39	D_TRAINF	FINE	0	0.00001	0	0.000156	0.002987	0.000127	0.00062	0.000327
HAML40	D_TRUCKF	FINE	0	0.00001	0.000189	0.000042	0.0006	0.00003	0.000038	0.000075
HAML41	TIRE_WR1	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE_WR2	FINE	0.0004	0.0001	0.0007	0.0001	0.0005	0.0001	0.0025	0.0001
HAML43	TIRE_WR3	FINE	0.0004	0.0001	0.0005	0.0001	0.0018	0.0001	0	0.0001
HAML44	TIRE_WR4	FINE	0.0004	-99	0.0006	-99	0.0012	-99	0.0013	-99
HAML45	BRAKEASB	FINE	0.138	0.0001	0.0022	0.0001	0.108	0.0001	0	0.0001
HAML46	BRAKEWER	FINE	0.083	-99	0.0003	-99	0.0679	-99	0	-99
HAML47	MTCOOKCH	FINE	0.0091	0.0001	0.0008	0.0001	0.0011	0.0001	0.001	0.0001
HAML48	MTCOOKFR	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML49	COOKING1	FINE	0.001905	0.002633	0.000651	0.000825	0.004782	0.00446	0.000048	0.000285
HAML50	COOKCHAR	FINE	0.000956	0.0001	0.000521	0.0001	0.00096	0.0001	0.000479	0.0001
HAML51	DEICER_F	FINE	0.404	0.04	0	0.1	0	0.1	0.00004	0.00003
HAML52	RWC_MEDF	FINE	0	0.00041	0	0.00085	0.00059	0.00056	0	0.0002
HAML53	RWC_POCF	FINE	0.00002	0.00001	0.00005	0.00004	0.00003	0.00003	0	0.00002
HAML54	RWC_F222	FINE	0	0.00001	0.000051	0.000044	0.000493	0.00003	0.000074	0.000072
HAML55	RWC_ALON	FINE	0.0007	0.0002	0.0002	0.0001	0	0.0001	0	0.0001
HAML56	RWC_COMP	FINE	0.0007	0.0002	0.0002	0.0001	0	0.0001	0	0.0001
HAML57	RWB_COMP	FINE	0.0002	0.0001	0.0001	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	FINE	0	0.0001	0	0.000078	0.000261	0.000222	0	0.000052
HAML61	RSWDBRN2	FINE	0	0.0001	0	0.000062	0.000169	0.000198	0	0.000053
HAML62	RSWDBRN3	FINE	0	0.0001	0	0.000056	0.00002	0.000023	0	0.000025
HAML63	RSWDBRN4	FINE	0	0.0001	0.000037	0.000061	0.000139	0.000015	0	0.000027
HAML64	RSWDBRN5	FINE	0	0.0001	0	0.000051	0.000457	0.000019	0	0.000027

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C16	S	C17	CL	C19	K	C20	CA	C22	TI
HAML01	ST_SANDF	0.000091	0.000147	0.051379	0.005776	0.04006	0.005156	0.016497	0.001883	0.004813	0.000254
HAML02	ERN_RUSF	0.005031	0.000695	0.002797	0.000339	0.03506	0.004541	0.010587	0.00123	0.004134	0.000233
HAML03	RUS_STF2	0.002367	0.000406	0.001001	0.000204	0.035728	0.004756	0.012546	0.001507	0.004267	0.000282
HAML04	DESP_LTF	0.002299	0.000338	0.000167	0.00009	0.040212	0.005202	0.013537	0.001563	0.003949	0.000221
HAML05	RDDST_BT	0.0103	0.001	0.0017	0.0002	0.0237	0.0024	0.0394	0.0039	0.0034	0.0004
HAML06	RDDST_CP	0.0057	0.0017	0.0013	0.0006	0.0114	0.002	0.0228	0.0056	0.0038	0.0007
HAML07	RDDST_HE	0.0208	0.0025	0.0037	0.0006	0.0156	0.0016	0.0586	0.0059	0.0035	0.0004
HAML08	RDDST_MS	0	0.0001	0.0003	0.0002	0.023	0.005	0.017	0.001	0.0026	0.0002
HAML09	UNDST_CP	0.0159	0.0019	0.0037	0.0005	0.0281	0.0029	0.0358	0.0041	0.005	0.0005
HAML10	UNDST_HE	0.0042	0.0006	0.0018	0.0003	0.0173	0.0017	0.0619	0.0062	0.0074	0.0007
HAML11	S04_FZER	0.333	0.033	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0	0.000001	0	0.000001	0	0.000001	0	0.000001	0	0.000001
HAML13	NH4NO3F2	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML14	LDV_PBCF	0.00011	0.000022	0.00157	0.000314	0.00092	0.000184	0.00097	0.000194	0.00004	0.000008
HAML15	LDV_XPBF	0.03255	0.02025	0.00066	0.00034	0.00011	0.00008	0.00526	0.00141	0.00004	0.00002
HAML16	LDV_DSLF	0.00589	0.00168	0.00025	0.00014	0.00005	0.00002	0.00021	0.00014	0	0.1
HAML17	LDV_DS2F	0.0062	0.00239	0.00035	0.00012	0.00013	0.00008	0.00023	0.00014	0	0.00001
HAML18	HDV_DSLF	0.00343	0.00055	0.00016	0.00022	0	0.0001	0.00048	0.00008	0.00002	0.00004
HAML19	LDV_NCAT	0	0.0001	0.0085	0.0001	0.0009	0.0001	0.0045	0.0001	0.0004	0.0001
HAML20	LDV_WCAT	0	0.0001	0.0245	0.0001	0	0.0001	0	0.0001	0.0001	0.0001
HAML21	HDV_TRK1	0.027	0.0001	0	0.0001	0.0017	0.0003	0.007	0.002	0.0001	0.0001
HAML22	HDV_TRK2	0	0.0001	0.0028	0.0001	0.0006	0.0001	0.0016	0.0001	0.0003	0.0001
HAML23	LDV_UNL1	0	0.0001	0	0.0001	0.0004	0.0001	0.0017	0.0001	0	0.0001
HAML24	LDV_UNL2	0.0539	0.0273	0.0005	0.0011	0.0002	0.0005	0.0035	0.0023	0.0001	0.0002
HAML25	GASEXST1	0.0025	0.00064	0.000447	0.000765	0.00023	0.00158	0.001573	0.000895	0	0.003473
HAML26	GASEXST2	0.010985	0.004374	0.002262	0.002036	0.000627	0.000484	0.005821	0.001918	0.000129	0.002842
HAML27	GASEXST3	0.006712	0.000533	0.00531	0.001877	0.000891	0.000792	0.00358	0.000963	0.000186	0.004603
HAML28	GASEXST4	0.005437	0.002624	0.001104	0.000625	0.000202	0.000215	0.002289	0.001675	0.00004	0.000862
HAML29	GASEXST5	0.004536	0.000169	0.001068	0.000226	0.000139	0.000313	0.001174	0.000254	0.000033	0.000971
HAML30	GASEXST6	0.008608	0.004545	0.001766	0.001608	0.000445	0.000371	0.004307	0.002517	0.000091	0.002065
HAML31	GASEXST7	0.003831	0.002576	0.000488	0.000545	0.000159	0.001193	0.001122	0.001157	0	0.002629
HAML32	GASEXST8	0.002362	0.000565	0	0.0001	0.000239	0.00141	0.001652	0.000995	0	0.003109
HAML33	DESLXST1	0.002967	0.001861	0.000682	0.001639	0.00006	0.000294	0.000598	0.000466	0.000005	0.00115
HAML34	DESLXST2	0.003262	0.002123	0.000735	0.00175	0.000065	0.000347	0.000662	0.000529	0.000006	0.00133
HAML35	DESLXST3	0.002732	0.00167	0.000638	0.001542	0.000055	0.000256	0.000547	0.000417	0.000004	0.001018
HAML36	DESLXST4	0.0061	0.00142	0.000891	0.000515	0	0.001174	0.000266	0.000851	0	0.002592
HAML37	DESLXST5	0.00329	0.001908	0.001753	0.000483	0.000081	0.000214	0.000621	0.000479	0	0.001128
HAML38	DESLXST6	0.002522	0.001455	0.000205	0.000297	0.000038	0.000156	0.000583	0.000531	0.000004	0.000753
HAML39	D_TRAINF	0.038635	0.000242	0.000556	0.000115	0.00021	0.000088	0.002701	0.000118	0	0.00031
HAML40	D_TRUCKF	0.006849	0.000051	0.000273	0.000035	0.000061	0.000023	0.000076	0.000018	0.000017	0.000081
HAML41	TIRE_WR1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE_WR2	0.0199	0.0001	0.015	0.0001	0	0.0001	0.0002	0.0001	0.0002	0.0001
HAML43	TIRE_WR3	0	0.0001	0.0006	0.0001	0.0004	0.0001	0.002	0.0001	0.0006	0.0001
HAML44	TIRE_WR4	0.0199	-99	0	0.0001	0.0004	-99	0.0011	-99	0.0004	-99
HAML45	BRAKEASB	0	0.0001	0.0015	0.0001	0	0.0001	0.019	0.0001	0	0.0001
HAML46	BRAKEWER	0.0128	-99	0	0.0001	0.0002	-99	0.0011	-99	0.0036	-99
HAML47	MTCOOKCH	0	0.0001	0.0037	0.0001	0.0016	0.0001	0.0006	0.0001	0.0001	0.0001
HAML48	MTCOOKFR	0	0.0001	0.0352	0.0001	0.0036	0.0001	0.0015	0.0001	0	0.0001
HAML49	COOKING1	0.002455	0.001843	0.00718	0.011944	0.003036	0.003243	0.001726	0.002115	0.000066	0.001528
HAML50	COOKCHAR	0.0019	0.0001	0.004029	0.0001	0.002468	0.0001	0.000335	0.0001	3.35E-05	0.0001
HAML51	DEICER_F	0.024	0.003	0.487	0.05	0.0022	0.0005	0.0006	0.0001	0	0.1
HAML52	RWC_MEDF	0.00159	0.0005	0.00129	0.00043	0.00497	0.00208	0.00018	0.00022	0.00002	0.00094
HAML53	RWC_POCF	0.00055	0.00004	0.00087	0.00012	0.00118	0.00023	0.00009	0.00002	0	0.00004
HAML54	RWC_F222	0.001425	0.000026	0.001856	0.000065	0.003546	0.000065	0.001265	0.000038	0.000047	0.00008
HAML55	RWC_ALON	0.0018	0.0002	0.0051	0.0003	0.0086	0.001	0.0007	0.0001	0	0.0001
HAML56	RWC_COMP	0.0018	0.0002	0.0051	0.0003	0.0086	0.0001	0.0007	0.0001	0	0.0001
HAML57	RWB_COMP	0.005	0.0001	0.0033	0.0002	0.0262	0.0001	0.0002	0.0001	0	0.0001
HAML58	WDSTVALL	0.018	0.0001	0.008	0.0001	0.08	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0.001	0.0001	0.001	0.0001	0.01	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0.000978	0.000446	0.001756	0.00089	0.00298	0.002665	0.000549	0.000644	0	0.000133
HAML61	RSWDBRN2	0.000701	0.000114	0.001197	0.000125	0.001298	0.000422	0.000491	0.000818	0	0.000139
HAML62	RSWDBRN3	0.000608	0.000021	0.001292	0.000046	0.00121	0.00004	0.000075	0.00001	0	0.000065
HAML63	RSWDBRN4	0.000596	0.000022	0.001315	0.000049	0.001044	0.000037	0.000134	0.000013	0	0.000078
HAML64	RSWDBRN5	0.000791	0.000025	0.001064	0.000036	0.001918	0.000058	0.000037	0.000015	0	0.000058



### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C23	V	C24	CR	C25	MN	C26	FE	C28	NI
HAML01	ST_SANDF	0	0.000058	0.000132	0.000023	0.000885	0.000054	0.050261	0.002582	0.000076	0.000015
HAML02	ERN_RUSF	0.000148	0.000056	0.00029	0.000035	0.000566	0.000047	0.047608	0.002535	0.000161	0.000022
HAML03	RUS_STF2	0	0.000073	0.000299	0.000054	0.000403	0.000066	0.045997	0.002807	0.000188	0.000038
HAML04	DESP_LTF	0.000055	0.000052	0.000119	0.000026	0.00074	0.000052	0.045618	0.002418	0.000083	0.000019
HAML05	RDDST_BT	0.0003	0.0001	0.0003	0.0001	0.0013	0.0001	0.0435	0.0044	0.0001	0.0001
HAML06	RDDST_CP	0.0002	0.0001	0.0004	0.0001	0.001	0.0002	0.0365	0.0048	0.0001	0.0001
HAML07	RDDST_HE	0.0002	0.0001	0	0.0001	0.0014	0.0002	0.0389	0.0039	0	0.0001
HAML08	RDDST_MS	0	0.0001	0	0.0001	0.0003	0.0001	0.032	0.004	0	0.0001
HAML09	UNDST_CP	0.0004	0.0001	0.0002	0.0001	0.0017	0.0002	0.0369	0.0038	0	0.0001
HAML10	UNDST_HE	0.0004	0.0001	0.0002	0.0001	0.0005	0.0001	0.0234	0.0023	0	0.0001
HAML11	S04_FZER	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0	0.000001	0	0.000001	0	0.000001	0	0.000001	0	0.000001
HAML13	NH4NO3F2	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML14	LDV_PBCF	0.00003	0.000006	0.00001	0.000002	0.01166	0.002332	0.00066	0.00132	0.00013	0.000026
HAML15	LDV_XPBF	0.00022	0.00011	0.00005	0.00004	0.00004	0.00003	0.00421	0.00124	0	0.1
HAML16	LDV_DSLF	0	0.1	0	0.1	0	0.1	0.00016	0.00006	0	0.1
HAML17	LDV_DS2F	0	0.00001	0	0.00001	0	0.00001	0.00002	0.00002	0	0.00001
HAML18	HDV_DSLF	0.00002	0.00003	0	0.00003	0	0.00003	0	0.00008	0.00002	0.00003
HAML19	LDV_PBCAT	0	0.0001	0.0001	0.0001	0.009	0.0001	0.0075	0.0001	0	0.0001
HAML20	LDV_WCAT	0	0.0001	0	0.0001	0	0.0001	0.0015	0.0001	0.0004	0.0001
HAML21	HDV_TRK1	0	0.0001	0	0.0001	0.0004	0.0001	0.006	0.001	0	0.0001
HAML22	HDV_TRK2	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0013	0.0001	0.0003	0.0001
HAML23	LDV_UNL1	0	0.0001	0	0.0001	0.0002	0.0001	0.0011	0.0001	0.0002	0.0001
HAML24	LDV_UNL2	0	0.0001	0	0.0001	0	0.0002	0	0.0004	0	0.0001
HAML25	GASEXST1	0	0.001585	0.000004	0.00028	0	0.0002	0.000852	0.000244	0	0.00007
HAML26	GASEXST2	0.000104	0.001194	0.000523	0.00031	0.000195	0.00032	0.01799	0.011531	0.000146	0.000204
HAML27	GASEXST3	0.000231	0.001927	0.00082	0.000497	0.000113	0.000529	0.009088	0.000367	0.000098	0.000333
HAML28	GASEXST4	0.00002	0.000379	0.000172	0.000086	0.000066	0.00008	0.007668	0.000483	0.000064	0.000047
HAML29	GASEXST5	0.000005	0.000447	0.000152	0.000094	0.000083	0.000062	0.007111	0.000075	0.000089	0.000029
HAML30	GASEXST6	0.000068	0.00087	0.000373	0.000234	0.00014	0.00023	0.013566	0.009848	0.000111	0.000147
HAML31	GASEXST7	0	0.001202	0.000006	0.000214	0.000005	0.000148	0.003298	0.004224	0.00001	0.000053
HAML32	GASEXST8	0	0.001419	0.000004	0.000251	0	0.000175	0.00086	0.000199	0.000002	0.000063
HAML33	DESLXST1	0.000011	0.00046	0	0.000121	0.000003	0.00009	0.000201	0.000226	0.000002	0.000057
HAML34	DESLXST2	0.000013	0.000531	0	0.000139	0.000004	0.000104	0.000217	0.000241	0.000002	0.000067
HAML35	DESLXST3	0.00001	0.000408	0	0.000107	0.000003	0.000079	0.000187	0.000213	0.000002	0.000051
HAML36	DESLXST4	0	0.001183	0	0.000211	0	0.000144	0.001296	0.0007	0.000037	0.000049
HAML37	DESLXST5	0.000009	0.000442	0	0.000115	0.000001	0.000088	0.000246	0.000125	0.000006	0.000058
HAML38	DESLXST6	0.000006	0.000326	0	0.000092	0	0.00006	0.000262	0.000291	0.000002	0.000038
HAML39	D_TRAINF	0.000056	0.000113	0.00008	0.000032	0.000042	0.000025	0.000373	0.00003	0.000016	0.000012
HAML40	D_TRUCKF	0.000004	0.00003	0.00001	0.000008	0.000008	0.000007	0.000048	0.000007	0.000003	0.000003
HAML41	TIRE_WR1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE_WR2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML43	TIRE_WR3	0	0.0001	0	0.0001	0.0001	0.0001	0.0046	0.0001	0.0001	0.0001
HAML44	TIRE_WR4	0	-99	0	-99	0.0001	-99	0.0046	-99	0.0001	-99
HAML45	BRAKEASB	0	0.0001	0.001	0.0001	0.0004	0.0001	0.04	0.0001	0	0.0001
HAML46	BRAKEWER	0.0007	-99	0.0012	-99	0.0017	-99	0.287	-99	0.0007	-99
HAML47	MTCOOKCH	0	0.0001	0	0.0001	0	0.0001	0.0007	0.0001	0.0001	0.0001
HAML48	MTCOOKFR	0	0.0001	0.0015	0.0001	0.0004	0.0001	0.0024	0.0001	0.0005	0.0001
HAML49	COOKING1	0.000003	0.00065	0.000034	0.000106	0.000256	0.000355	0.003152	0.003914	0.000055	0.000052
HAML50	COOKCHAR	0.000002	0.0001	0	0.0001	5E-07	0.0001	0.000457	0.0001	6.25E-05	0.0001
HAML51	DEICER_F	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML52	RWC_MEDF	0.00001	0.00038	0.00001	0.0001	0.00003	0.00007	0.00042	0.00052	0	0.00004
HAML53	RWC_POCF	0	0.00002	0	0.001	0.00001	0.001	0	0.001	0	0.001
HAML54	RWC_F222	0.000006	0.000029	0.000005	0.000008	0.000058	0.000008	0.000111	0.000008	0.000001	0.000003
HAML55	RWC_ALON	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML56	RWC_COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML57	RWB_COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0	0.000054	0	0.000012	0.00002	0.000024	0.000036	0.000038	0	0.000005
HAML61	RSWDBRN2	0	0.000057	0	0.000006	0.000015	0.000029	0.000036	0.000048	0	0.000005
HAML62	RSWDBRN3	0	0.000026	0	0.000006	0	0.000005	0.000007	0.000002	0	0.000002
HAML63	RSWDBRN4	0.000002	0.000032	0	0.000008	0.000002	0.000006	0.000014	0.000003	0	0.000003
HAML64	RSWDBRN5	0	0.000024	0	0.000006	0	0.000005	0.000014	0.000002	0	0.000002

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C29	CU	C30	ZN	C31	GA	C32	GE	C33	AS
HAML01	ST_SANDF	0.000133	0.000015	0.00012	0.000014	0.000003	0.000007	0	0.000006	0.000038	0.00002
HAML02	ERN_RUSF	0.000115	0.000018	0.0007	0.000047	0.000015	0.000011	0.000013	0.00001	0.000007	0.000042
HAML03	RUS_STF2	0.00008	0.000027	0.000733	0.00006	0.000047	0.000015	0.00004	0.000015	0	0.000064
HAML04	DESP_LTF	0.0001	0.000017	0.00036	0.000029	0.000014	0.000009	0	0.000008	0.000018	0.000027
HAML05	RDDST_BT	0.0033	0.0003	0.0025	0.0003	0	0.0001	0	0.0001	0.0002	0.0001
HAML06	RDDST_CP	0.001	0.0002	0.002	0.0005	0	0.0001	0	0.0001	0.0004	0.0002
HAML07	RDDST_HE	0.0038	0.0004	0.0129	0.0013	0	0.0001	0	0.0001	0.0034	0.0005
HAML08	RDDST_MS	0.0011	0.0003	0.0004	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML09	UNDST_CP	0.0095	0.0012	0.0038	0.0005	0	0.0001	0	0.0001	0.0003	0.0001
HAML10	UNDST_HE	0.0001	0.0001	0.0003	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML11	S04_FZER	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0	0.000001	0	0.000001	0	0.000001	0	0.000001	0	0.000001
HAML13	NH4NO3F2	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML14	LDV_PBCF	0.00029	0.000058	0.00129	0.000258	0.00035	0.00007	0	0.1	0.00096	0.000192
HAML15	LDV_XPBF	0.00031	0.00024	0.00592	0.00263	0.00001	0.00001	0	0.1	0	0.1
HAML16	LDV_DSLF	0.00001	0.000002	0.00047	0.00027	0	0.1	0	0.1	0.00002	0.00001
HAML17	LDV_DS2F	0.00002	0.00001	0.00037	0.00011	0	0.00001	0	0.1	0.00002	0.00002
HAML18	HDV_DSLF	0.00001	0.00003	0.00053	0.00017	0	0.00002	0	0.1	0	0.00008
HAML19	LDV_NCAT	0	0.0001	0.0061	0.0001	0	0.0001	0	0.0001	0.0004	0.0001
HAML20	LDV_WCAT	0.0112	0.0001	0.0106	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML21	HDV_TRK1	0.0003	0.0001	0.0016	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML22	HDV_TRK2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.0002	0.0001
HAML23	LDV_UNL1	0.0002	0.0001	0.0008	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML24	LDV_UNL2	0.0001	0.0002	0.0012	0.0005	0.0001	0.0001	0	0.0001	0	0.0001
HAML25	GASEXST1	0.000098	0.00008	0.00056	0.001118	0.000011	0.000165	0	0.0001	0.000015	0.000111
HAML26	GASEXST2	0.000392	0.000212	0.006534	0.002866	0.000007	0.000237	0	0.0001	0.000003	0.000454
HAML27	GASEXST3	0.000222	0.000352	0.003033	0.000308	0.000019	0.000379	0	0.0001	0.000009	0.000412
HAML28	GASEXST4	0.000192	0.000181	0.002571	0.002408	0	0.000069	0	0.0001	0.000001	0.000243
HAML29	GASEXST5	0.000094	0.000033	0.00117	0.000215	0	0.000069	0	0.0001	0	0.000362
HAML30	GASEXST6	0.000306	0.000209	0.004835	0.003245	0.000004	0.000173	0	0.0001	0.000002	0.000403
HAML31	GASEXST7	0.000111	0.000059	0.000327	0.000847	0.000005	0.00013	0	0.0001	0.000012	0.000132
HAML32	GASEXST8	0.00009	0.000071	0.000491	0.001001	0.000008	0.000148	0	0.0001	0.000015	0.000099
HAML33	DESLXST1	0	0.000062	0.000593	0.000806	0.000003	0.000095	0	0.0001	0.000003	0.000106
HAML34	DESLXST2	0.000001	0.000072	0.000657	0.000907	0.000004	0.000109	0	0.0001	0.000004	0.000123
HAML35	DESLXST3	0	0.000055	0.000542	0.000726	0.000003	0.000084	0	0.0001	0.000003	0.000094
HAML36	DESLXST4	0.000057	0.000057	0	0.000823	0	0.00013	0	0.0001	0.000009	0.000126
HAML37	DESLXST5	0.000003	0.000063	0.000587	0.000305	0.000013	0.000091	0	0.0001	0.000008	0.000101
HAML38	DESLXST6	0	0.00004	0.000682	0.001172	0	0.000062	0	0.0001	0.000003	0.00007
HAML39	D_TRAINF	0.000053	0.000017	0.000048	0.00002	0	0.00001	0	0.00001	0.000023	0.000066
HAML40	D_TRUCKF	0.000003	0.000004	0.000025	0.000005	0	0.00001	0	0.00001	0	0.000017
HAML41	TIRE_WR1	0	0.0001	0.01	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE_WR2	0	0.0001	0.0102	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML43	TIRE_WR3	0.0005	0.0001	0.0004	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML44	TIRE_WR4	0.0005	-99	0.0053	-99	0	0.0001	0	0.0001	0	-99
HAML45	BRAKEASB	0	0.0001	0.0031	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML46	BRAKEWER	0.0115	-99	0.0003	-99	0	0.0001	0	0.0001	0	-99
HAML47	MTCOOKCH	0.0034	0.0001	0.0022	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML48	MTCOOKFR	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML49	COOKING1	0.000278	0.000476	0.000363	0.000428	0.000001	0.000201	0	0.0001	0.000007	0.000111
HAML50	COOKCHAR	0.000143	0.0001	0.000309	0.0001	0	0.0001	0	0.0001	3.5E-06	0.0001
HAML51	DEICER_F	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML52	RWC_MEDF	0.00009	0.00012	0.00053	0.00058	0	0.00015	0	0.001	0.00001	0.00011
HAML53	RWC_POCF	0	0.001	0.00021	0.00008	0	0.00001	0	0.0001	0	0.00001
HAML54	RWC_F222	0	0.000005	0.000289	0.000009	0	0.00001	0	0.00001	0	0.000019
HAML55	RWC_ALON	0	0.0001	0.0004	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML56	RWC_COMP	0	0.0001	0.0004	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML57	RWB_COMP	0	0.0001	0.0001	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0	0.000005	0.000317	0.000347	0	0.000018	0	0.0001	0	0.00002
HAML61	RSWDBRN2	0	0.000004	0.000095	0.000038	0	0.000018	0	0.0001	0	0.000021
HAML62	RSWDBRN3	0	0.000004	0.000092	0.000003	0	0.000009	0	0.0001	0	0.000008
HAML63	RSWDBRN4	0	0.000004	0.000105	0.000004	0	0.000011	0	0.0001	0.000002	0.00001
HAML64	RSWDBRN5	0	0.000003	0.000137	0.000004	0	0.000008	0	0.0001	0	0.000007

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C34	SE	C35	BR	C37	RB	C38	SR	C39	Y
HAML01	ST_SANDF	0.000003	0.000007	0.00002	0.000009	0.000173	0.000017	0.000091	0.000016	0	0.000017
HAML02	ERN_RUSF	0	0.000011	0.000054	0.000017	0.000156	0.000022	0.000129	0.000023	0	0.000027
HAML03	RUS_STF2	0	0.000022	0.000042	0.000029	0.000177	0.00004	0.000073	0.000042	0	0.000051
HAML04	DESP_LTF	0.000006	0.000009	0.000008	0.000012	0.000126	0.00002	0.000031	0.000018	0	0.000022
HAML05	RDDST_BT	0	0.0001	0	0.0001	0	0.0001	0.0003	0.0001	0	0.0001
HAML06	RDDST_CP	0	0.0001	0.0002	0.0001	0	0.0001	0.0001	0.0001	0	0.0001
HAML07	RDDST_HE	0.0001	0.0001	0.0011	0.0001	0	0.0001	0.0002	0.0001	0	0.0001
HAML08	RDDST_MS	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML09	UNDST_CP	0	0.0001	0.0001	0.0001	0	0.0001	0.0003	0.0001	0	0.0001
HAML10	UNDST_HE	0	0.0001	0	0.0001	0	0.0001	0.0003	0.0001	0	0.0001
HAML11	S04_FZER	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0	0.000001	0	0.000001	0	0.000001	0	0.000001	0	0.000001
HAML13	NH4NO3F2	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML14	LDV_PBCF	0	0.1	0.08274	0.016548	0.00003	0.000006	0	0.1	0.00001	0.000009
HAML15	LDV_XPBF	0	0.1	0.00249	0.00114	0	0.1	0	0.1	0	0.1
HAML16	LDV_DSLF	0	0.1	0.00005	0.00001	0	0.1	0	0.1	0	0.1
HAML17	LDV_DS2F	0	0.00001	0.00002	0.00001	0	0.00001	0	0.00001	0	0.00002
HAML18	HDV_DSLF	0	0.00003	0	0.00003	0	0.00004	0	0.00005	0	0.00007
HAML19	LDV_NCAT	0	0.0001	0.0338	0.0001	0.0001	0.0001	0.0001	0.0001	0	0.0001
HAML20	LDV_WCAT	0	0.0001	0.0004	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML21	HDV_TRK1	0	0.0001	0	0.0001	0	0.0001	0.0001	0	0	0.0001
HAML22	HDV_TRK2	0	0.0001	0.0001	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML23	LDV_UNL1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML24	LDV_UNL2	0	0.0001	0.0041	0.0031	0	0.0001	0	0.0001	0	0.0001
HAML25	GASEXST1	0	0.00005	0.000008	0.000049	0	0.000076	0	0.000136	0	0.000078
HAML26	GASEXST2	0.000008	0.000138	0.000389	0.000372	0.000005	0.00011	0.000016	0.000118	0	0.000147
HAML27	GASEXST3	0.000029	0.000222	0.000015	0.000191	0.000015	0.000171	0.000018	0.000191	0	0.000233
HAML28	GASEXST4	0	0.000035	0.000303	0.000414	0	0.000036	0.000004	0.000034	0	0.000042
HAML29	GASEXST5	0	0.000026	0.000781	0.000021	0	0.000046	0.000001	0.000034	0	0.00004
HAML30	GASEXST6	0.000004	0.000099	0.000352	0.000358	0.000003	0.00008	0.00001	0.000085	0	0.000108
HAML31	GASEXST7	0.000002	0.000037	0.000059	0.000091	0	0.000058	0	0.000103	0	0.00006
HAML32	GASEXST8	0.000003	0.000043	0.000006	0.000044	0	0.000068	0	0.000122	0	0.00007
HAML33	DESLXST1	0.000002	0.000056	0.000012	0.000051	0.000008	0.000048	0.000001	0.000052	0.000005	0.000064
HAML34	DESLXST2	0.000003	0.000065	0.000013	0.000059	0.000009	0.000055	0.000001	0.00006	0.000005	0.000075
HAML35	DESLXST3	0.000002	0.00005	0.000011	0.000045	0.000008	0.000042	0.000001	0.000046	0.000004	0.000057
HAML36	DESLXST4	0	0.000036	0.000006	0.000037	0	0.000056	0	0.000101	0	0.000058
HAML37	DESLXST5	0.000002	0.000054	0.000009	0.000049	0.000008	0.000045	0	0.000049	0	0.000061
HAML38	DESLXST6	0	0.000037	0.000015	0.000033	0.000001	0.000031	0.000001	0.000034	0.000002	0.000042
HAML39	D_TRAINF	0.000021	0.000029	0.000014	0.000025	0	0.00004	0.000045	0.000057	0	0.00001
HAML40	D_TRUCKF	0.000007	0.000008	0.000013	0.000007	0.000008	0.000011	0.000007	0.000016	0	0.00001
HAML41	TIRE_WR1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE_WR2	0	0.0001	0	0.0001	0	0.0001	0.0001	0.0001	0	0.0001
HAML43	TIRE_WR3	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML44	TIRE_WR4	0	-99	0	-99	0	-99	0.0001	-99	0	0.0001
HAML45	BRAKEASB	0	0.0001	0	0.0001	0	0.0001	0.0004	0.0001	0	0.0001
HAML46	BRAKEWER	0	-99	0	-99	0.0001	-99	0.0007	-99	0	0.0001
HAML47	MTCOOKCH	0	0.0001	0.0001	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML48	MTCOOKFR	0.0001	0.0001	0.0008	0.0001	0.0009	0.0001	0.0001	0.0001	0	0.0001
HAML49	COOKING1	0.000001	0.000046	0.00007	0.000139	0.000004	0.00005	0.000011	0.000064	0	0.000078
HAML50	COOKCHAR	5E-07	0.0001	3.85E-05	0.0001	1.5E-06	0.0001	5.5E-06	0.0001	0	0.0001
HAML51	DEICER_F	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML52	RWC_MEDF	0	0.00006	0.00003	0.00005	0.00001	0.00005	0	0.00006	0	0.00008
HAML53	RWC_POCF	0	0.001	0.00001	0.00001	0	0.001	0	0.001	0	0.001
HAML54	RWC_F222	0.000006	0.000008	0.000019	0.000007	0.000017	0.000012	0.000042	0.000016	0	0.00001
HAML55	RWC_ALON	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML56	RWC_COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML57	RWB_COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0	0.000008	0.000017	0.000011	0	0.000008	0	0.000008	0	0.000012
HAML61	RSWDBRN2	0	0.000009	0.000011	0.000004	0	0.000009	0	0.000007	0	0.000012
HAML62	RSWDBRN3	0	0.000004	0.000009	0.000003	0	0.000004	0	0.000005	0	0.000006
HAML63	RSWDBRN4	0.000001	0.000005	0.000011	0.000002	0	0.000005	0.000001	0.000006	0	0.000007
HAML64	RSWDBRN5	0	0.000004	0.000007	0.000001	0.000003	0.000004	0	0.000004	0	0.000005

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C40	ZR	C42	MO	C46	PD	C47	AG	C48	CD
HAML01	ST SANDF	0.000009	0.000042	0	0.000056	0	0.000064	0	0.000082	0	0.0001
HAML02	ERN RUSF	0.000143	0.000066	0	0.000092	0.000084	0.000092	0.000147	0.000116	0.000118	0.000137
HAML03	RUS STF2	0.000082	0.000128	0.000071	0.000182	0	0.000173	0.000481	0.00022	0.000447	0.000275
HAML04	DESP LTF	0.000136	0.000059	0.000023	0.000082	0	0.000076	0	0.000098	0	0.000124
HAML05	RDDST BT	0	0.0001	0	0.0001	0.0002	0.0001	0	0.0001	0	0.0001
HAML06	RDDST CP	0	0.0001	0	0.0001	0	0.0001	0	0.0002	0.0003	0.0003
HAML07	RDDST HE	0	0.0001	0	0.0001	0	0.0001	0.0002	0.0004	0.0023	0.0007
HAML08	RDDST MS	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML09	UNDST CP	0	0.0001	0	0.0001	0.0002	0.0002	0	0.0001	0.0001	0.0003
HAML10	UNDST HE	0	0.0001	0	0.0001	0.0005	0.0002	0	0.0001	0	0.0001
HAML11	S04 FZER	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0	0.000001	0	0.000001	0	0.000001	0	0.000001	0	0.000001
HAML13	NH4NO3F2	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML14	LDV PBCF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML15	LDV XPBF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML16	LDV DSLF	0	0.00002	0	0.00001	0	0.00001	0	0.00002	0	0.00002
HAML17	LDV DS2F	0	0.00008	0	0.00005	0	0.00005	0	0.00006	0	0.00008
HAML18	HDV DSLF	0	0.0003	0	0.00018	0	0.00018	0.00009	0.00025	0	0.00032
HAML19	LDV NCAF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML20	LDV WCAT	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML21	HDV TRK1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML22	HDV TRK2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML23	LDV UNL1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML24	LDV UNL2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML25	GASEXST1	0.00001	0.00011	0.00001	0.00012	0.00003	0.00033	0.00007	0.00035	0.000026	0.00041
HAML26	GASEXST2	0.000012	0.000166	0.000018	0.000307	0.000089	0.001009	0.000182	0.001093	0.000127	0.001193
HAML27	GASEXST3	0.00002	0.000268	0.000034	0.000497	0.000162	0.001634	0.000317	0.001768	0.000143	0.00193
HAML28	GASEXST4	0.000006	0.000042	0.000023	0.000071	0.000008	0.000246	0.000043	0.000268	0.000039	0.000294
HAML29	GASEXST5	0.000002	0.000034	0.00001	0.000045	0.000011	0.000146	0.000029	0.000158	0.000019	0.000177
HAML30	GASEXST6	0.000009	0.000119	0.00002	0.000219	0.000054	0.000724	0.000122	0.000784	0.000089	0.000856
HAML31	GASEXST7	0.000002	0.000084	0.000005	0.000093	0.000027	0.000247	0.000058	0.000268	0.000017	0.000311
HAML32	GASEXST8	0.000004	0.000099	0.000007	0.00011	0.000023	0.000293	0.000068	0.000317	0.000022	0.000367
HAML33	DESLXST1	0	0.000076	0.000007	0.00014	0.00002	0.000386	0.000147	0.000433	0.000049	0.000462
HAML34	DESLXST2	0	0.000088	0.000008	0.000162	0.000022	0.000447	0.000164	0.000502	0.000053	0.000535
HAML35	DESLXST3	0	0.000067	0.000007	0.000124	0.000019	0.000342	0.000133	0.000382	0.000045	0.000409
HAML36	DESLXST4	0	0.000083	0	0.000091	0.00002	0.000237	0.000055	0.000257	0.000014	0.000299
HAML37	DESLXST5	0	0.000072	0.000002	0.000132	0	0.000379	0.000111	0.000433	0.000079	0.000452
HAML38	DESLXST6	0	0.00005	0.000002	0.000092	0.000026	0.000249	0.000061	0.000281	0.000044	0.000298
HAML39	D TRAINF	0	0.000159	0	0.00001	0	0.00001	0	0.00001	0.000181	0.000289
HAML40	D TRUCKF	0	0.000043	0	0.00001	0	0.00001	0	0.00001	0	0.000074
HAML41	TIRE WR1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE WR2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML43	TIRE WR3	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML44	TIRE WR4	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML45	BRAKEASB	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML46	BRAKEWER	0	0.0001	0.0037	-99	0	0.0001	0	0.0001	0	0.0001
HAML47	MTCOOKCH	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML48	MTCOOKFR	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML49	COOKING1	0.000067	0.001602	0	0.000165	0.000012	0.000316	0.000044	0.00039	0.000007	0.000398
HAML50	COOKCHAR	0	0.0001	0	0.0001	0	0.0001	0.000044	0.0001	0.000002	0.0001
HAML51	DEICER F	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML52	RWC MEDF	0	0.0001	0.00002	0.00018	0	0.00036	0	0.00041	0	0.00046
HAML53	RWC POCF	0	0.00001	0	0.00001	0	0.00002	0	0.00002	0.00001	0.00002
HAML54	RWC F222	0.00005	0.000046	0	0.00001	0	0.00001	0	0.00001	0	0.000071
HAML55	RWC ALON	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML56	RWC COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML57	RWB COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0	0.000015	0	0.000027	0	0.000051	0	0.000059	0	0.000064
HAML61	RSWDBRN2	0	0.000016	0	0.000028	0	0.000053	0	0.000061	0	0.000068
HAML62	RSWDBRN3	0	0.000008	0	0.000014	0	0.000024	0	0.000029	0	0.000031
HAML63	RSWDBRN4	0	0.000009	0	0.000016	0	0.000029	0.000005	0.000034	0.000013	0.000038
HAML64	RSWDBRN5	0	0.000007	0	0.000012	0	0.000023	0.000006	0.000026	0	0.000028

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C49	IN	C50	SN	C51	SB	C56	BA	C57	LA
HAML01	ST SANDF	0	0.00012	0	0.000154	0	0.000185	0.002177	0.000787	0	0.001048
HAML02	ERN RUSF	0.00034	0.00019	0	0.00023	0	0.000287	0	0.001177	0.002004	0.001598
HAML03	RUS STF2	0.000193	0.00035	0.000523	0.000461	0.000264	0.000558	0.004926	0.002333	0.00476	0.003205
HAML04	DESP LTF	0	0.000153	0	0.000189	0.000184	0.000233	0	0.001028	0.004419	0.001385
HAML05	RDDST BT	0	0.0001	0	0.0001	0.0009	0.0006	0	0.0001	0	0.0001
HAML06	RDDST CP	0	0.0002	0.0001	0.0003	0.0002	0.0005	0.0001	0.0013	0	0.0001
HAML07	RDDST HE	0	0.0007	0.0005	0.0008	0.0012	0.0015	0.001	0.0038	0	0.0001
HAML08	RDDST MS	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML09	UNDST CP	0.0002	0.0003	0	0.0001	0.0001	0.0007	0.002	0.0019	0	0.0001
HAML10	UNDST HE	0	0.0001	0	0.0001	0.0003	0.0009	0.0032	0.0025	0	0.0001
HAML11	S04 FZER	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0	0.000001	0	0.000001	0	0.000001	0	0.000001	0	0.000001
HAML13	NH4NO3F2	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML14	LDV PBCF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML15	LDV XPBF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML16	LDV DSLF	0	0.00003	0	0.00003	0	0.00007	0	0.00013	0	0.00025
HAML17	LDV DS2F	0	0.0001	0	0.00012	0	0.00027	0	0.00051	0	0.00094
HAML18	HDV DSLF	0	0.0004	0	0.00048	0	0.00109	0	0.00202	0	0.00368
HAML19	LDV NCAF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML20	LDV WCAT	0	0.0001	0	0.0001	0	0.0001	0.0012	0.0001	0	0.0001
HAML21	HDV TRK1	0	0.0001	0	0.0001	0	0.0001	0.0008	0.0001	0	0.0001
HAML22	HDV TRK2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML23	LDV UNL1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML24	LDV UNL2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML25	GASEXST1	0.00005	0.000406	0.00002	0.00054	0.000085	0.000577	0.002484	0.008619	0.00001	0.002427
HAML26	GASEXST2	0.000017	0.00139	0.000132	0.001761	0.000096	0.002111	0.000308	0.007779	0.000088	0.010564
HAML27	GASEXST3	0.000024	0.002251	0.000282	0.002851	0.000197	0.003419	0.000681	0.012603	0.000077	0.01712
HAML28	GASEXST4	0.000021	0.000338	0.000106	0.00042	0.000055	0.000512	0.000163	0.002234	0.000137	0.002547
HAML29	GASEXST5	0.000034	0.000191	0.00018	0.000234	0.000077	0.000285	0.00007	0.002312	0.000197	0.001349
HAML30	GASEXST6	0.000019	0.000996	0.000121	0.001262	0.000079	0.001514	0.000246	0.005633	0.000109	0.00757
HAML31	GASEXST7	0.000036	0.000308	0.000018	0.000406	0.000078	0.000438	0.00168	0.006558	0.000035	0.001846
HAML32	GASEXST8	0.00005	0.000364	0.000019	0.00048	0.000114	0.000518	0.00252	0.007722	0.000007	0.00218
HAML33	DESLXST1	0.000072	0.000554	0.000075	0.000716	0.000019	0.000854	0.000532	0.003168	0.000217	0.00421
HAML34	DESLXST2	0.000083	0.000641	0.000084	0.000827	0.000021	0.000988	0.000597	0.003664	0.000238	0.004868
HAML35	DESLXST3	0.000063	0.00049	0.000069	0.000634	0.000018	0.000756	0.000481	0.002806	0.0002	0.003729
HAML36	DESLXST4	0.000035	0.000296	0.000019	0.000391	0.00009	0.000422	0.001046	0.006589	0.000054	0.001784
HAML37	DESLXST5	0.000078	0.000548	0.000195	0.000717	0.000026	0.000838	0.00083	0.003118	0	0.004095
HAML38	DESLXST6	0.000018	0.000357	0.000025	0.000471	0.000019	0.000559	0.00035	0.002051	0.000272	0.002757
HAML39	D TRAINF	0	0.00001	0	0.00001	0.000645	0.000348	0.001324	0.001005	0	0.00001
HAML40	D TRUCKF	0	0.00001	0	0.00001	0.000065	0.000089	0.000083	0.000262	0	0.00001
HAML41	TIRE WR1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE WR2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML43	TIRE WR3	0	0.0001	0	0.0001	0	0.0001	0.0004	0.0001	0	0.0001
HAML44	TIRE WR4	0	0.0001	0	0.0001	0	0.0001	0.0002	-99	0	0.0001
HAML45	BRAKEASB	0	0.0001	0	0.0001	0	0.0001	0.0092	0.0001	0	0.0001
HAML46	BRAKEWER	0	0.0001	0.00066	-99	0	0.0001	0.0545	-99	0	0.0001
HAML47	MTCOOKCH	0	0.0001	0	0.0001	0	0.0001	0.002	0.0001	0	0.0001
HAML48	MTCOOKFR	0	0.0001	0	0.0001	0	0.0001	0.0046	0.0001	0	0.0001
HAML49	COOKING1	0.000012	0.000475	0.000026	0.000704	0.000216	0.000797	0.00022	0.003728	0.000112	0.004968
HAML50	COOKCHAR	0.000002	0.0001	0.000014	0.0001	0.000027	0.0001	0.00021	0.0001	0.0001	0.0001
HAML51	DEICER F	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML52	RWC MEDF	0	0.00055	0	0.00074	0	0.00081	0.00021	0.00297	0.00001	0.00334
HAML53	RWC POCF	0	0.00002	0	0.00003	0	0.00004	0.00002	0.00013	0.00011	0.00015
HAML54	RWC F222	0	0.00001	0	0.00001	0.00007	0.000087	0.000258	0.000256	0	0.00001
HAML55	RWC ALON	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML56	RWC COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML57	RWB COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0	0.000076	0	0.000102	0	0.000119	0	0.000408	0	0.000476
HAML61	RSWDBRN2	0	0.000079	0	0.000106	0	0.000124	0	0.000426	0	0.000497
HAML62	RSWDBRN3	0.000002	0.000037	0.000015	0.00005	0	0.000058	0.000126	0.000196	0.000072	0.000228
HAML63	RSWDBRN4	0	0.000044	0	0.000059	0.000011	0.00007	0.000077	0.000241	0.000079	0.000282
HAML64	RSWDBRN5	0.000008	0.000033	0.00002	0.000045	0.000002	0.000053	0.000055	0.000177	0.000057	0.000207

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C80	HG	C82	PB	C200	TC	C201	OC	C202	EC
HAML01	ST SANDF	0	0.000012	0.000005	0.000032	0.005788	0.001656	0.005788	0.000402	0	0.001608
HAML02	ERN RUSF	0	0.000017	0.000367	0.000059	0.088622	0.027722	0.088622	0.025997	0	0.009637
HAML03	RUS STF2	0.000104	0.000029	0.00027	0.000098	0.092446	0.014278	0.088996	0.013065	0.003449	0.004625
HAML04	DESP LTF	0	0.000015	0.000105	0.000042	0.035653	0.003477	0.035653	0.002815	0	0.002038
HAML05	RDDST BT	0	0.0001	0.0018	0.0002	0	0.0001	0	0.0001	0	0.0001
HAML06	RDDST CP	0	0.0001	0.0039	0.001	0	0.0001	0.0318	0.015	0.0047	0.0033
HAML07	RDDST HE	0.0002	0.0001	0.0247	0.0025	0	0.0001	0	0.0001	0	0.0001
HAML08	RDDST MS	0	0.0001	0.0013	0.0002	0	0.0001	0.1	0.0001	0.014	0.0001
HAML09	UNDST CP	0	0.0001	0.0011	0.0002	0	0.0001	0	0.0001	0	0.0001
HAML10	UNDST HE	0	0.0001	0.0004	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML11	S04 FZER	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0	0.000001	0	0.000001	0	0.000001	0	0.000001	0	0.000001
HAML13	NH4NO3F2	0	0.00001	0	0.00001	0	0.000014	0	0.00001	0	0.00001
HAML14	LDV PBCF	0.00002	0.000018	0.19821	0.039642	0.49799	0.084818	0.41611	0.083222	0.08188	0.016376
HAML15	LDV XPBF	0.00001	0.00001	0.00364	0.00138	0.87832	0.127898	0.49202	0.09893	0.3863	0.08106
HAML16	LDV DSLF	0	0.1	0.00016	0.00013	0.89497	0.14085	0.23635	0.0549	0.65862	0.12971
HAML17	LDV DS2F	0	0.00001	0.00025	0.00017	1.06104	0.073579	0.43358	0.02103	0.62746	0.07051
HAML18	HDV DSLF	0	0.00003	0	0.00011	0.88104	0.057591	0.36046	0.03406	0.52058	0.04644
HAML19	LDV NCAT	0	0.0001	0.0866	0.0001	0	0.0001	0.65	0.0001	0.0801	0.0001
HAML20	LDV WCAT	0	0.0001	0.0019	0.0001	0	0.0001	0.501	0.0001	0.226	0.0001
HAML21	HDV TRK1	0	0.0001	0.013	0.003	0	0.0001	0.209	0.0001	0.548	0.0001
HAML22	HDV TRK2	0	0.0001	0	0.0001	0	0.0001	0.326	0.0001	0.405	0.0001
HAML23	LDV UNL1	0	0.0001	0	0.0001	0	0.0001	0.211	0.0001	0.178	0.0001
HAML24	LDV UNL2	0	0.0002	0	0.0006	0	0.0001	0.9291	0.5174	0.0483	0.068
HAML25	GASEXST1	0.00001	0.00014	0.000225	0.000223	0.833024	0.033825	0.7718	0.033578	0.061223	0.030365
HAML26	GASEXST2	0.000002	0.000315	0.002252	0.001329	0.808111	0.049022	0.433517	0.091606	0.374594	0.084459
HAML27	GASEXST3	0.000009	0.000506	0.000356	0.000543	0.816766	0.070421	0.538563	0.048488	0.278203	0.051069
HAML28	GASEXST4	0	0.000085	0.001149	0.000846	0.859487	0.035144	0.519218	0.169008	0.340269	0.203396
HAML29	GASEXST5	0.000001	0.000071	0.002126	0.000058	0.89993	0.032912	0.333416	0.015305	0.566513	0.029137
HAML30	GASEXST6	0.000001	0.000228	0.001779	0.001212	0.83445	0.041542	0.475375	0.119002	0.359075	0.128379
HAML31	GASEXST7	0.000006	0.000121	0.000463	0.000504	0.844731	0.032374	0.695579	0.139336	0.149152	0.162283
HAML32	GASEXST8	0.000008	0.000129	0.000185	0.000214	0.831421	0.034028	0.775962	0.033862	0.055459	0.00335
HAML33	DESLXST1	0	0.000127	0.000003	0.000154	0.939271	0.037229	0.189289	0.07886	0.749982	0.102669
HAML34	DESLXST2	0	0.000147	0.000003	0.000177	0.946986	0.03916	0.13948	0.055758	0.807506	0.077093
HAML35	DESLXST3	0	0.000113	0.000003	0.000136	0.93284	0.036272	0.230403	0.095497	0.702437	0.120941
HAML36	DESLXST4	0	0.000133	0.000383	0.000447	0.921953	0.034867	0.307311	0.136645	0.614641	0.161304
HAML37	DESLXST5	0	0.000121	0.000001	0.000147	0.933226	0.033793	0.198087	0.077406	0.735138	0.101438
HAML38	DESLXST6	0	0.000084	0.000001	0.000101	0.946829	0.03364	0.175588	0.075777	0.771241	0.096654
HAML39	D TRAINF	0.000294	0.000114	0.000135	0.000104	0.888	0.080483	0.8	0.08	0.088	0.0088
HAML40	D TRUCKF	0	0.000028	0.000043	0.000029	0.959	0.088083	0.877	0.0877	0.082	0.0082
HAML41	TIRE WR1	0	0.0001	0	0.0001	0	0.0001	0.2175	0.0001	0.609	0.0001
HAML42	TIRE WR2	0	0.0001	0	0.0001	0	0.0001	0.583	0.0001	0.287	0.0001
HAML43	TIRE WR3	0	0.0001	0.0002	0.0001	0	0.0001	0.36	0.0001	0.153	0.0001
HAML44	TIRE WR4	0	0.0001	0.0002	-99	0	0.0001	0.4715	-99	0.22	-99
HAML45	BRAKEASB	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML46	BRAKEWER	0	0.0001	0.0001	-99	0	0.0001	0.107	-99	0.0261	-99
HAML47	MTCOOKCH	0	0.0001	0.0003	0.0001	0	0.0001	0.588	0.0001	0	0.0001
HAML48	MTCOOKFR	0	0.0001	0.002	0.0001	0	0.0001	0.574	0.0001	0	0.0001
HAML49	COOKING1	0.000001	0.000091	0.000131	0.000357	0.96804	0.174052	0.866333	0.16309	0.101707	0.062895
HAML50	COOKCHAR	0.000001	0.0001	0.000066	0.0001	0	0.0001	0.809977	0.0001	0.040563	0.0001
HAML51	DEICER F	0	0.1	0	0.1	0.0028	0.0004	0.0028	0.0004	0	0.1
HAML52	RWC MEDF	0.00004	0.0002	0.00007	0.00018	0.63213	0.099039	0.48868	0.06759	0.14345	0.07239
HAML53	RWC POCF	0	0.00001	0	0.00001	0.53248	0.091316	0.45356	0.08871	0.07892	0.02166
HAML54	RWC F222	0.000009	0.00003	0.000099	0.00003	0.843	0.081067	0.81	0.081	0.033	0.0033
HAML55	RWC ALON	0	0.0001	0	0.0001	0	0.0001	0.475	0.138	0.128	0.084
HAML56	RWC COMP	0	0.0001	0	0.0001	0	0.0001	0.475	0.138	0.128	0.084
HAML57	RWB COMP	0	0.0001	0	0.0001	0	0.0001	0.4185	0.083	0.1505	0.0849
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0.359	0.0001	0.064	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0.387	0.0001	0.045	0.0001
HAML60	RSWDBRN1	0	0.00003	0	0.000016	0.706333	0.171481	0.551734	0.158401	0.154599	0.065689
HAML61	RSWDBRN2	0	0.000031	0	0.000014	0.706292	0.188745	0.58012	0.183841	0.126172	0.042749
HAML62	RSWDBRN3	0	0.000015	0	0.000013	0.619308	0.041502	0.545075	0.041294	0.074233	0.00415
HAML63	RSWDBRN4	0	0.000018	0.000001	0.000015	0.814796	0.05215	0.660123	0.051312	0.154673	0.009316
HAML64	RSWDBRN5	0	0.000013	0	0.000011	0.936987	0.054448	0.752901	0.053285	0.184086	0.011194

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C203	SO4	C204	NO3	C205	NH4	C217	CL2	C219	K2
HAML01	ST SANDF	0.003289	0.000365	0	0.001218	0	0.001218	0.049944	0.005545	0.004385	0.000487
HAML02	ERN RUSF	0.015327	0.004688	0	0.007299	0.027736	0.008484	0.018979	0.005805	0.025549	0.007814
HAML03	RUS STF2	0.004528	0.000772	0	0.003484	0	0.003484	0.005924	0.001009	0.012195	0.002078
HAML04	DESP LTF	0	0.001543	0	0.001543	0	0.001543	0	0.001543	0.005401	0.000633
HAML05	RDDST BT	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML06	RDDST CP	0.0007	0.0011	0.0001	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML07	RDDST HE	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML08	RDDST MS	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML09	UNDST CP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML10	UNDST HE	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML11	S04 FZER	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML12	NH4SO4F2	0.7273	0.036365	0	0.00001	0.2727	0.0136	0	0.00001	0	0.00001
HAML13	NH4NO3F2	0	0.00001	0.775	0.0388	0.225	0.02251	0	0.00001	0	0.00001
HAML14	LDV PBCF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML15	LDV XPBF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML16	LDV DSLF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML17	LDV DS2F	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML18	HDV DSLF	0	0.1	0	0.1	0	0.1	0	0.1	0	0.1
HAML19	LDV NCAT	0.0045	0.0001	0.0063	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML20	LDV WCAT	0.0359	0.0001	0.0181	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML21	HDV TRK1	0.049	0.009	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML22	HDV TRK2	0.0022	0.0001	0.0033	0.0001	0.0008	0.0001	0	0.0001	0	0.0001
HAML23	LDV UNL1	0.5	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML24	LDV UNL2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML25	GASEXST1	0.00238	0.00109	0.00282	0.00246	0	0.0001	0.000271	0.000463	0	0.0001
HAML26	GASEXST2	0.017285	0.00556	0.002004	0.001557	0	0.0001	0.001371	0.001234	0	0.0001
HAML27	GASEXST3	0.017474	0.003354	0.003534	0.002521	0	0.0001	0.003218	0.001138	0	0.0001
HAML28	GASEXST4	0.004475	0.002085	0.001015	0.000376	0	0.0001	0.000669	0.000378	0	0.0001
HAML29	GASEXST5	0.00408	0.000313	0.001178	0.000173	0	0.0001	0.000647	0.000137	0	0.0001
HAML30	GASEXST6	0.011795	0.007987	0.00158	0.001115	0	0.0001	0.00107	0.000975	0	0.0001
HAML31	GASEXST7	0.003519	0.002166	0.002404	0.001772	0	0.0001	0.000295	0.00033	0	0.0001
HAML32	GASEXST8	0.002306	0.000742	0.00283	0.002279	0	0.0001	0.000295	0.000384	0	0.0001
HAML33	DESLXST1	0.004167	0.004468	0.001657	0.001437	0	0.0001	0.000413	0.000993	0	0.0001
HAML34	DESLXST2	0.004626	0.00497	0.001859	0.001729	0	0.0001	0.000445	0.00106	0	0.0001
HAML35	DESLXST3	0.003805	0.004084	0.001502	0.001232	0	0.0001	0.000387	0.000934	0	0.0001
HAML36	DESLXST4	0.007191	0.002191	0.00386	0.001276	0	0.0001	0.00054	0.000312	0	0.0001
HAML37	DESLXST5	0.004629	0.004823	0.002016	0.001409	0	0.0001	0.001062	0.000293	0	0.0001
HAML38	DESLXST6	0.00295	0.00356	0.001141	0.000824	0	0.0001	0.000124	0.00018	0	0.0001
HAML39	D TRAINF	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML40	D TRUCKF	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML41	TIRE WR1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE WR2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML43	TIRE WR3	0.0025	0.0001	0.0015	0.0001	0.0002	0.0001	0	0.0001	0	0.0001
HAML44	TIRE WR4	0	0.0001	0.0015	-99	0.0002	-99	0.0078	-99	0	0.0001
HAML45	BRAKEASB	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML46	BRAKEWER	0	0.0001	0.0016	-99	0	-99	0.0015	-99	0	0.0001
HAML47	MTCOOKCH	0.0021	0.0001	0.0002	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML48	MTCOOKFR	0.0091	0.0001	0.0208	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML49	COOKING1	0.003816	0.013882	0.002691	0.005956	0.000482	0.005991	0.007589	0.008405	0.002155	0.002298
HAML50	COOKCHAR	0.001349	0.0001	0.001446	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML51	DEICER F	0.073	0.01	0	0.1	0	0.1	0.487	0.05	0.0022	0.0005
HAML52	RWC MEDF	0.01125	0.0133	0.00568	0.00701	0.00384	0.0055	0.00478	0.00546	0.00497	0.00208
HAML53	RWC POCF	0.00141	0.00033	0.00066	0.00027	0.00075	0.00033	0.00076	0.0001	0.00146	0.00054
HAML54	RWC F222	0	0.00001	0	0.00001	0	0.00001	0	0.00001	0	0.00001
HAML55	RWC ALON	0.0029	0.0002	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML56	RWC COMP	0.0029	0.0002	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML57	RWB COMP	0.0007	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0.002223	0.001864	0.00146	0.001168	0.000715	0.000441	0.000017	0.000008	0.00246	0.002181
HAML61	RSWDBRN2	0.001058	0.000564	0.001178	0.001396	0.000506	0.000379	0.000011	0.000001	0.001086	0.000404
HAML62	RSWDBRN3	0.001082	0.000157	0.003121	0.000117	0.000571	0.000036	0.000012	0.0001	0.001045	0.000045
HAML63	RSWDBRN4	0.001404	0.000213	0.000353	0.000094	0.000998	0.000053	0.000013	0.0001	0.000774	0.00005
HAML64	RSWDBRN5	0.001493	0.000154	0.001237	0.000075	0.000351	0.000032	0.00001	0.0001	0.001668	0.000057

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C300	F2	C301	NA2	C302	CA2	C303	MG2	C304	NA
HAML01	ST SANDF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML02	ERN RUSF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML03	RUS STF2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML04	DESP LTF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML05	RDDST BT	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML06	RDDST CP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML07	RDDST HE	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML08	RDDST MS	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML09	UNDST CP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML10	UNDST HE	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML11	S04 FZER	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML12	NH4SO4F2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML13	NH4NO3F2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML14	LDV PBCF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML15	LDV XPBF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML16	LDV DSLF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML17	LDV DS2F	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML18	HDV DSLF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML19	LDV NCAT	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML20	LDV WCAT	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML21	HDV TRK1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML22	HDV TRK2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML23	LDV UNL1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML24	LDV UNL2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML25	GASEXST1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML26	GASEXST2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.00166	0.004102
HAML27	GASEXST3	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.005516	0.005516
HAML28	GASEXST4	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.000494	0.001361
HAML29	GASEXST5	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.000403	0.000304
HAML30	GASEXST6	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.00116	0.003148
HAML31	GASEXST7	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML32	GASEXST8	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML33	DESLXST1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.001403	0.002203
HAML34	DESLXST2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.001592	0.00265
HAML35	DESLXST3	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.00126	0.001889
HAML36	DESLXST4	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML37	DESLXST5	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML38	DESLXST6	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML39	D TRAINF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML40	D TRUCKF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML41	TIRE WR1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML42	TIRE WR2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML43	TIRE WR3	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML44	TIRE WR4	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.0006	-99
HAML45	BRAKEASB	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML46	BRAKEWER	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	-99
HAML47	MTCOOKCH	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML48	MTCOOKFR	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML49	COOKING1	0	0.0001	0.002373	0.001957	0	0.0001	0	0.0001	0.011632	0.018156
HAML50	COOKCHAR	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.003	0.0001
HAML51	DEICER F	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML52	RWC MEDF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML53	RWC POCF	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML54	RWC F222	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML55	RWC ALON	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML56	RWC_COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML57	RWB_COMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML58	WDSTVALL	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML59	WDSTVPIN	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML60	RSWDBRN1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML61	RSWDBRN2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML62	RSWDBRN3	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML63	RSWDBRN4	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML64	RSWDBRN5	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001



### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C305	CO
HAML01	ST SANDF	0	0.0001
HAML02	ERN RUSF	0	0.0001
HAML03	RUS STF2	0	0.0001
HAML04	DESP LTF	0	0.0001
HAML05	RDDST BT	0	0.0001
HAML06	RDDST CP	0	0.0001
HAML07	RDDST HE	0	0.0001
HAML08	RDDST MS	0	0.0001
HAML09	UNDST CP	0	0.0001
HAML10	UNDST HE	0	0.0001
HAML11	S04 FZER	0	0.0001
HAML12	NH4SO4F2	0	0.0001
HAML13	NH4NO3F2	0	0.0001
HAML14	LDV PBCF	0	0.0001
HAML15	LDV XPBF	0	0.0001
HAML16	LDV DSLF	0	0.0001
HAML17	LDV DS2F	0	0.0001
HAML18	HDV DSLF	0	0.0001
HAML19	LDV NCAT	0	0.0001
HAML20	LDV WCAT	0	0.0001
HAML21	HDV TRK1	0	0.0001
HAML22	HDV TRK2	0	0.0001
HAML23	LDV UNL1	0	0.0001
HAML24	LDV UNL2	0	0.0001
HAML25	GASEXST1	0	0.000076
HAML26	GASEXST2	0.000039	0.000437
HAML27	GASEXST3	0.000112	0.000393
HAML28	GASEXST4	0.000005	0.000149
HAML29	GASEXST5	0.000002	0.000132
HAML30	GASEXST6	0.000024	0.000312
HAML31	GASEXST7	0.000001	0.000097
HAML32	GASEXST8	0	0.000069
HAML33	DESLXST1	0.000001	0.000057
HAML34	DESLXST2	0.000001	0.000066
HAML35	DESLXST3	0.000001	0.00005
HAML36	DESLXST4	0	0.000063
HAML37	DESLXST5	0.000001	0.000057
HAML38	DESLXST6	0.000002	0.000038
HAML39	D TRAINF	0	0.0001
HAML40	D TRUCKF	0	0.0001
HAML41	TIRE WR1	0	0.0001
HAML42	TIRE WR2	0	0.0001
HAML43	TIRE WR3	0	0.0001
HAML44	TIRE WR4	0	0.0001
HAML45	BRAKEASB	0	0.0001
HAML46	BRAKEWER	0	0.0001
HAML47	MTCOOKCH	0	0.0001
HAML48	MTCOOKFR	0	0.0001
HAML49	COOKING1	0.000014	0.000092
HAML50	COOKCHAR	0.000008	0.0001
HAML51	DEICER F	0	0.0001
HAML52	RWC MEDF	0	0.0001
HAML53	RWC POCF	0	0.0001
HAML54	RWC F222	0	0.0001
HAML55	RWC ALON	0	0.0001
HAML56	RWC COMP	0	0.0001
HAML57	RWB COMP	0	0.0001
HAML58	WDSTVALL	0	0.0001
HAML59	WDSTVPIN	0	0.0001
HAML60	RSWDBRN1	0	0.000006
HAML61	RSWDBRN2	0	0.000007
HAML62	RSWDBRN3	0.000001	0.000003
HAML63	RSWDBRN4	0.000002	0.000003
HAML64	RSWDBRN5	0.000001	0.000002

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	SIZE	C12	MG	C13	AL	C14	SI	C15	P
HAML65	RSWDBRN6	FINE	0	0.000213	0.000345	0.000043	0.000492	0.000035	0.000032	0.000077
HAML66	RSWDBRN7	FINE	0.00002	0.000035	0.000124	0.000192	0.000246	0.000218	0.000013	0.000017
HAML67	RWCCOMP1	FINE	0	0.0001	0.00161	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	FINE	0.00002	0.00024	0.00002	0.00049	0.00021	0.00032	0	0.0001
HAML69	RWCHSCMP	FINE	0.000113	0.0001	0.00011	0.0001	0.00034	0.0001	0.00004	0.0001
HAML70	RWCHSNAC	FINE	0.000113	0.0001	0.000088	0.0001	0.000228	0.0001	0.000013	0.0001
HAML71	RWCSFTCP	FINE	0.000182	0.0001	0.000124	0.0001	0.00034	0.0001	0.000025	0.0001
HAML72	GRAINDST	FINE	0	0.0001	0	0.0001	0.15	0.0001	0	0.0001
HAML73	CMNTKILN	FINE	0.0024	0.00024	0.0428	0.0043	0.0844	0.00844	0.00017	0.00075
HAML74	GYPSALC	FINE	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML75	SOILDUST	FINE	0.02	0.007	0.18	0.01	0.48	0.02	0	0.0001

PNO	SID	C16	S	C17	CL	C19	K	C20	CA	C22	TI
HAML65	RSWDBRN6	0.003315	0.000041	0.002263	0.000092	0.02228	0.000127	0.000678	0.000105	0	0.000192
HAML66	RSWDBRN7	0.001796	0.00132	0.001284	0.000889	0.009341	0.0113	0.000309	0.000325	0	0.0001
HAML67	RWCCOMP1	0.00596	0.0001	0.0038	0.0001	0.00865	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0.00098	0.00029	0.001	0.00029	0.00289	0.00127	0.00012	0.00013	0.00001	0.00054
HAML69	RWCHSCMP	0.001815	0.0001	0.001973	0.0001	0.009671	0.0001	0.0001	0.0001	0	0.0001
HAML70	RWCHSNAC	0.001808	0.0001	0.001973	0.0001	0.00865	0.0001	0.00017	0.0001	0	0.0001
HAML71	RWCSFTCP	0.001398	0.0001	0.001284	0.0001	0.007021	0.0001	0.00017	0.0001	0	0.0001
HAML72	GRAINDST	0	0.0001	0	0.0001	0.0055	0.0001	0.0055	0.0001	0	0.0001
HAML73	CMNTKILN	0.068	0.014	0	0.0001	0.054	0.015	0.1	0.013	0.00298	0.00036
HAML74	GYPSALC	0.1366	0.0001	0	0.0001	0.0055	0.0001	0.13	0.0001	0	0.0001
HAML75	SOILDUST	0.0024	0.0015	0	0.0001	0.02	0.001	0.018	0.001	0.0076	0.0006

PNO	SID	C23	V	C24	CR	C25	MN	C26	FE	C28	NI
HAML65	RSWDBRN6	0	0.000121	0	0.00004	0.000041	0.000006	0.000465	0.000009	0	0.000008
HAML66	RSWDBRN7	0	0.0001	0	0.0001	0.000017	0.000021	0.000167	0.000259	0	0.0001
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0	0.0001	0	0.0001	0.00001	0.00004	0.00015	0.0003	0	0.0001
HAML69	RWCHSCMP	0	0.0001	0	0.0001	0	0.0001	0.00009	0.0001	0	0.0001
HAML70	RWCHSNAC	0	0.0001	0	0.0001	0	0.0001	0.000057	0.0001	0	0.0001
HAML71	RWCSFTCP	0	0.0001	0	0.0001	0	0.0001	0.00009	0.0001	0	0.0001
HAML72	GRAINDST	0	0.0001	0	0.0001	0	0.0001	0.0005	0.0001	0	0.0001
HAML73	CMNTKILN	0.0001	0.00002	0.00027	0.00024	0.00034	0.00019	0.0093	0.0014	0.00093	0.00096
HAML74	GYPSALC	0	0.0001	0.0055	0.0001	0.0005	0.0001	0.0055	0.0001	0.0055	0.0001
HAML75	SOILDUST	0.0003	0.0002	0.0002	0.0002	0.0028	0.0003	0.085	0.005	0	0.0001

PNO	SID	C29	CU	C30	ZN	C31	GA	C32	GE	C33	AS
HAML65	RSWDBRN6	0.000013	0.000003	0.000397	0.000006	0	0.000021	0	0.0001	0	0.000021
HAML66	RSWDBRN7	0.000004	0.000007	0.000301	0.000159	0	0.0001	0	0.0001	0	0.0001
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0.00003	0.00007	0.00027	0.00034	0	0.0001	0	0.0001	0.00001	0.00006
HAML69	RWCHSCMP	0	0.0001	0.00022	0.0001	0	0.0001	0	0.0001	0.000002	0.0001
HAML70	RWCHSNAC	0	0.0001	0.000299	0.0001	0	0.0001	0	0.0001	5E-07	0.0001
HAML71	RWCSFTCP	0.000004	0.0001	0.000299	0.0001	0	0.0001	0	0.0001	0.000001	0.0001
HAML72	GRAINDST	0.0005	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML73	CMNTKILN	0.00023	0.00004	0.00217	0.00022	0	0.0001	0	0.0001	0.00004	0.0001
HAML74	GYPSALC	0.0005	0.0001	0.0005	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML75	SOILDUST	0.0005	0.0003	0	0.0001	0	0.0001	0	0.0001	0	0.0001

### Helena PM<sub>2.5</sub> Source Profiles, cont.

PNO	SID	C34	SE	C35	BR	C37	RB	C38	SR	C39	Y
HAML65	RSWDBRN6	0	0.00001	0.000006	0.000009	0.000012	0.000003	0.000006	0.000009	0	0.000011
HAML66	RSWDBRN7	0	0.0001	0.000007	0.000004	0.000006	0.000005	0.000002	0.000003	0	0.0001
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0	0.0001	0.00001	0.00003	0	0.0001	0	0.0001	0	0.0001
HAML69	RWCHSCMP	0	0.0001	0.000024	0.0001	0.000006	0.0001	0	0.0001	0	0.0001
HAML70	RWCHSNAC	0	0.0001	0.000017	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML71	RWCSFTCP	0	0.0001	0.000024	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML72	GRAINDST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML73	CMNTKILN	0.0001	0.00003	0	0.0001	0.00075	0.00019	0.00032	0.00003	0	0.0001
HAML74	GYPSALC	0.0005	0.0001	0	0.0001	0	0.0001	0.0005	0.0001	0	0.0001
HAML75	SOILDUST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001

PNO	SID	C40	ZR	C42	MO	C46	PD	C47	AG	C48	CD
HAML65	RSWDBRN6	0	0.000013	0	0.000024	0	0.000064	0	0.000076	0.000004	0.000077
HAML66	RSWDBRN7	0	0.0001	0	0.0001	0.000003	0.000006	0.000007	0.000012	0.000006	0.000007
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0	0.0001	0.00001	0.00011	0	0.0001	0	0.0001	0	0.0001
HAML69	RWCHSCMP	0	0.0001	0	0.0001	0.000001	0.0001	0.000007	0.0001	0.000007	0.0001
HAML70	RWCHSNAC	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML71	RWCSFTCP	0	0.0001	0	0.0001	0.000002	0.0001	7.5E-06	0.0001	1.35E-05	0.0001
HAML72	GRAINDST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML73	CMNTKILN	0	0.0001	0.00016	0.00015	0.00005	0.00009	0.00006	0.00004	0.00016	0.00015
HAML74	GYPSALC	0	0.0001	0.0005	0.0001	0	0.0001	0	0.0001	0.0005	0.0001
HAML75	SOILDUST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001

PNO	SID	C49	IN	C50	SN	C51	SB	C56	BA	C57	LA
HAML65	RSWDBRN6	0	0.000093	0.000021	0.00012	0	0.000141	0.000119	0.00051	0.000475	0.000676
HAML66	RSWDBRN7	0	0.0001	0.000013	0.000011	0	0.0001	0.000063	0.00006	0.000235	0.000237
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0	0.0001	0	0.0001	0	0.0001	0.00009	0.00171	0.00006	0.00192
HAML69	RWCHSCMP	0	0.0001	0.00001	0.0001	0	0.0001	0	0.0001	0.00001	0.0001
HAML70	RWCHSNAC	0	0.0001	0	0.0001	0	0.0001	1.35E-05	0.0001	0.000035	0.0001
HAML71	RWCSFTCP	4.5E-06	0.0001	1.15E-05	0.0001	5.5E-06	0.0001	0	0.0001	4.45E-05	0.0001
HAML72	GRAINDST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML73	CMNTKILN	0.00006	0.00008	0.00004	0.00004	0	0.0001	0.00034	0.00007	0.00024	0.00024
HAML74	GYPSALC	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML75	SOILDUST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001

PNO	SID	C80	HG	C82	PB	C200	TC	C201	OC	C202	EC
HAML65	RSWDBRN6	0	0.000021	0	0.000031	0.568513	0.031458	0.403634	0.020245	0.164879	0.024079
HAML66	RSWDBRN7	0	0.0001	0	0.0001	0.637606	0.124509	0.513711	0.117216	0.123895	0.041988
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0.00001	0.00012	0.00002	0.00011	0	0.0001	0.47132	0.06719	0.10772	0.04482
HAML69	RWCHSCMP	0	0.0001	0.000006	0.0001	0	0.0001	0.528184	0.0001	0.055791	0.0001
HAML70	RWCHSNAC	0	0.0001	0.000002	0.0001	0	0.0001	0.519406	0.0001	0.089044	0.0001
HAML71	RWCSFTCP	0	0.0001	0.000006	0.0001	0	0.0001	0.528184	0.0001	0.064794	0.0001
HAML72	GRAINDST	0	0.0001	0	0.0001	0.3	0.0001	0	0.0001	0	0.0001
HAML73	CMNTKILN	0.00001	0.00001	0.0182	0.0028	0	0.0001	0.054	0.006	0.002	0.004
HAML74	GYPSALC	0	0.0001	0.0005	0.0001	0.01	0.0001	0	0.0001	0	0.0001
HAML75	SOILDUST	0	0.0001	0.0008	0.0006	0	0.0001	0	0.0001	0	0.0001

**Helena PM<sub>2.5</sub> Source Profiles, cont.**

PNO	SID	C203	SO4	C204	NO3	C205	NH4	C217	CL2	C219	K2
HAML65	RSWDBRN6	0.011983	0.000371	0.00081	0.00018	0.001124	0.000188	0.003638	0.00018	0.026861	0.000214
HAML66	RSWDBRN7	0.009139	0.003809	0.000735	0.000188	0.001271	0.0002	0.002577	0.001142	0.01397	0.011577
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0.00487	0.00765	0.00244	0.00403	0.00186	0.00317	0.00214	0.00315	0.00773	0.0127
HAML69	RWCHSCMP	0.0041	0.0001	0.0019	0.0001	0.0015	0.0001	0	0.0001	0	0.0001
HAML70	RWCHSNAC	0.0041	0.0001	0.0018	0.0001	0.001136	0.0001	0	0.0001	0	0.0001
HAML71	RWCSFTCP	0.001846	0.0001	0.0013	0.0001	0.001586	0.0001	0	0.0001	0	0.0001
HAML72	GRAINDST	0.0055	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML73	CMNTKILN	0.183	0.064	0.002	0.0004	0	0.0001	0	0.0001	0	0.0001
HAML74	GYPSCALC	0.41	0.0001	0.0005	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML75	SOILDUST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001

PNO	SID	C300	F2	C301	NA2	C302	CA2	C303	MG2	C304	NA
HAML65	RSWDBRN6	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.000481
HAML66	RSWDBRN7	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.000054	0.000093
HAML67	RWCCOMP1	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML68	RWCCOMP2	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.00042	0.00079
HAML69	RWCHSCMP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.00094	0.0001
HAML70	RWCHSNAC	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.0009	0.0001
HAML71	RWCSFTCP	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.0009	0.0001
HAML72	GRAINDST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML73	CMNTKILN	0.002	0.00028	0	0.0001	0	0.0001	0	0.0001	0.0229	0.0046
HAML74	GYPSCALC	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0	0.0001
HAML75	SOILDUST	0	0.0001	0	0.0001	0	0.0001	0	0.0001	0.01	0.002

PNO	SID	C305	CO
HAML65	RSWDBRN6	0	0.000012
HAML66	RSWDBRN7	0	0.0001
HAML67	RWCCOMP1	0	0.0001
HAML68	RWCCOMP2	0.00001	0.00002
HAML69	RWCHSCMP	0	0.0001
HAML70	RWCHSNAC	0	0.0001
HAML71	RWCSFTCP	0	0.0001
HAML72	GRAINDST	0	0.0001
HAML73	CMNTKILN	0.001	0.001
HAML74	GYPSCALC	0	0.0001
HAML75	SOILDUST	0	0.0001

## **Appendix C: Helena CMB Final Outputs**

Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:     HELEN        BRITT & LUECKE:     No     INHELEN2.IN8  
SAMPLE DATE: 11/2/07   SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
DURATION:   24        BEST FIT:            No     POHELEN2.txt  
START HOUR:  0                                DSHELEN2.SEL  
SIZE:     FINE                                ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.96	% MASS	99.1
CHI SQUARE	0.20	DEGREES FREEDOM	36

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE   NAME    SCE( $\mu\text{g}/\text{m}^3$ )   Std Err   Tstat  
-----  
YES HAML01 ST\_SANDF  0.94948   0.31643   3.00064  
YES HAML11 S04\_FZER  0.71149   0.08189   8.68797  
YES HAML13 NH4NO3F2  0.71487   0.09981   7.16219  
YES HAML61 RSWDBRN2  6.54341   1.62446   4.02804

-----  
8.91926

MEASURED CONCENTRATION FOR SIZE: FINE

9.0+-  0.0

Eligible Space Collinearity Display

=====  
ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 1.80000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.08182  0.09978  0.31641  1.62447  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML01 1.0000 HAML11 1.0000 HAML13 1.0000 HAML61  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====  
 =====

SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL  
 -----

SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU		9.00000+-	0.00010	8.91926+-	1.65091	0.99+-	0.18	0.0
C12	MG	*	0.00280<	0.00640	0.00162<	0.07115	0.58<	25.45	0.0
C13	AL	*	0.06640+-	0.00670	0.08219+-	0.07215	1.24+-	1.09	0.2
C14	SI	*	0.19320+-	0.01090	0.20613+-	0.07705	1.07+-	0.40	0.2
C15	P	*	0.00360+-	0.00130	0.00000+-	0.07115	0.00+-	19.76	-0.1
C16	S	*	0.24160+-	0.01380	0.24160+-	0.02349	1.00+-	0.11	0.0
C17	CL		0.00430+-	0.00210	0.05662+-	0.07136	13.17+-	17.80	0.7
C19	K	*	0.07020+-	0.00410	0.04653+-	0.07137	0.66+-	1.02	-0.3
C20	CA	*	0.07050+-	0.01000	0.01888+-	0.07137	0.27+-	1.01	-0.7
C22	TI	*	0.00470+-	0.00060	0.00457+-	0.07116	0.97+-	15.14	0.0
C23	V	*	0.00000<	0.00030	0.00000<	0.07115	0.00<	0.00	0.0
C24	CR	*	0.00020<	0.00040	0.00013<	0.07115	0.63<	*****	0.0
C25	MN	*	0.00260+-	0.00060	0.00094+-	0.07115	0.36+-	27.37	0.0
C26	FE	*	0.08510+-	0.00450	0.04796+-	0.07119	0.56+-	0.84	-0.5
C28	NI	*	0.00050<	0.00070	0.00007<	0.07115	0.14<	*****	0.0
C29	CU	*	0.00660+-	0.00080	0.00013+-	0.07115	0.02+-	10.78	-0.1
C30	ZN	*	0.01460+-	0.00100	0.00074+-	0.07115	0.05+-	4.87	-0.2
C31	GA	*	0.00050+-	0.00040	0.00000+-	0.07115	0.01+-	*****	0.0
C32	GE	*	0.00050+-	0.00040	0.00000+-	0.07115	0.00+-	*****	0.0
C33	AS	*	0.00000<	0.00080	0.00004<	0.07115	0.00<	0.00	0.0
C34	SE	*	0.00000<	0.00030	0.00000<	0.07115	0.00<	0.00	0.0
C35	BR		0.00310+-	0.00030	0.00009+-	0.07115	0.03+-	22.95	0.0
C37	RB	*	0.00010<	0.00030	0.00016<	0.07115	1.64<	*****	0.0
C38	SR	*	0.00060+-	0.00030	0.00009+-	0.07115	0.14+-	*****	0.0
C39	Y	*	0.00000<	0.00040	0.00000<	0.07115	0.00<	0.00	0.0
C40	ZR	*	0.00050<	0.00060	0.00001<	0.07115	0.02<	*****	0.0

C42	MO	*	0.00080+-	0.00080	0.00000+-	0.07115	0.00+-88.94	0.0
C46	PD	*	0.00000<	0.00260	0.00000<	0.07115	0.00< 0.00	0.0
C47	AG	*	0.00000<	0.00280	0.00000<	0.07115	0.00< 0.00	0.0
C48	CD	*	0.00000<	0.00280	0.00000<	0.07115	0.00< 0.00	0.0
C49	IN	*	0.00000<	0.00310	0.00000<	0.07115	0.00< 0.00	0.0
C50	SN	*	0.00000<	0.00350	0.00000<	0.07115	0.00< 0.00	0.0
C51	SB	*	0.00000<	0.00370	0.00000<	0.07115	0.00< 0.00	0.0
C56	BA	*	0.00000<	0.00160	0.00207<	0.07121	0.00< 0.00	0.0
C57	LA	*	0.00000<	0.00110	0.00000<	0.07123	0.00< 0.00	0.0
C80	HG	*	0.00010<	0.00070	0.00000<	0.07115	0.00< *****	0.0
C82	PB	*	0.00710+-	0.00110	0.00000+-	0.07115	0.00+-10.02	-0.1
C200	TC		5.39330+-	0.41910	4.62706+-	1.23709	0.86+- 0.24	-0.6
C201	OC	*	4.88560+-	0.34410	3.80146+-	1.20505	0.78+- 0.25	-0.9
C202	EC	*	0.49940+-	0.12480	0.82560+-	0.28864	1.65+- 0.71	1.0
C203	SO4		0.79480+-	0.03980	0.01005+-	0.07125	0.01+- 0.09	-9.6
C204	NO3	*	0.51190+-	0.02560	0.56173+-	0.07692	1.10+- 0.16	0.6
C205	NH4	*	0.30960+-	0.01550	0.16416+-	0.07300	0.53+- 0.24	-1.9
C217	CL2		0.00000<	0.06240	0.04749<	0.07134	0.00< 0.00	0.5
C219	K2		0.00000<	0.06240	0.01127<	0.07120	0.00< 0.00	0.1
C300	F2		0.08490+-	0.00420	0.00000+-	0.00067	0.00+- 0.01	-20.0
C301	NA2		0.42860+-	0.02130	0.00000+-	0.00067	0.00+- 0.00	-20.1
C302	CA2		0.34290+-	0.01710	0.00000+-	0.00067	0.00+- 0.00	-20.0
C303	MG2		0.03590+-	0.00180	0.00000+-	0.00067	0.00+- 0.02	-18.7
C304	NA	*	0.00000<	0.01860	0.00000<	0.00067	0.00< 0.00	0.0
C305	CO	*	0.00000<	0.00140	0.00000<	0.00015	0.00< 0.00	0.0

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Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:

SITE:     HELEN            BRITT & LUECKE:     No     INHELEN2.IN8  
SAMPLE DATE: 11/8/07     SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
DURATION:   24            BEST FIT:            No     POHELEN2.txt  
START HOUR:  0                                 DSHELEN2.SEL  
SIZE:     FINE                                 ADHELEN2.txt  
   PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.93	% MASS	100.0
CHI SQUARE	0.35	DEGREES FREEDOM	36

SOURCE CONTRIBUTION ESTIMATES:

SOURCE

EST CODE	NAME	SCE( $\mu\text{g}/\text{m}^3$ )	Std Err	Tstat
YES HAML02	ERN_RUSF	1.90221	0.45701	4.16231
YES HAML11	S04_FZER	0.92951	0.10720	8.67103
YES HAML13	NH4NO3F2	0.82779	0.12873	6.43054
YES HAML61	RSWDBRN2	8.13591	2.01520	4.03727

-----  
11.79541

MEASURED CONCENTRATION FOR SIZE: FINE

11.8+- 0.0

Eligible Space Collinearity Display

=====

ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 2.36000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.10689 0.12859 0.45690 2.01525  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML02 1.0000 HAML11 1.0000 HAML13 1.0000 HAML61  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL

-----  
 SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU	11.80000+-	0.00010	11.79541+-	2.05094	1.00+-	0.17	0.0
C12	MG *	0.03160+-	0.01250	0.00577+-	0.09296	0.18+-	2.94	-0.3
C13	AL *	0.13850+-	0.01080	0.14879+-	0.09549	1.07+-	0.69	0.1
C14	SI *	0.35290+-	0.01920	0.40686+-	0.10995	1.15+-	0.32	0.5
C15	P *	0.00000<	0.00140	0.00000<	0.09296	0.00<	0.00	0.0
C16	S *	0.32480+-	0.01800	0.32480+-	0.03072	1.00+-	0.11	0.0
C17	CL	0.00000<	0.00240	0.01506<	0.09296	0.00<	0.00	0.2
C19	K *	0.11730+-	0.00640	0.07725+-	0.09341	0.66+-	0.80	-0.4
C20	CA *	0.14490+-	0.01250	0.02413+-	0.09322	0.17+-	0.64	-1.3
C22	TI *	0.00870+-	0.00080	0.00786+-	0.09296	0.90+-	10.69	0.0
C23	V *	0.00000<	0.00040	0.00028<	0.09295	0.00<	0.00	0.0
C24	CR *	0.00000<	0.00050	0.00055<	0.09295	0.00<	0.00	0.0
C25	MN *	0.00220+-	0.00080	0.00120+-	0.09295	0.54+-	42.25	0.0
C26	FE *	0.12060+-	0.00630	0.09085+-	0.09308	0.75+-	0.77	-0.3
C28	NI *	0.00000<	0.00080	0.00031<	0.09295	0.00<	0.00	0.0
C29	CU *	0.02140+-	0.00150	0.00022+-	0.09295	0.01+-	4.34	-0.2
C30	ZN *	0.02430+-	0.00160	0.00210+-	0.09295	0.09+-	3.83	-0.2
C31	GA *	0.00000<	0.00050	0.00003<	0.09295	0.00<	0.00	0.0
C32	GE *	0.00000<	0.00050	0.00002<	0.09295	0.00<	0.00	0.0
C33	AS *	0.00030<	0.00080	0.00001<	0.09295	0.04<	*****	0.0
C34	SE *	0.00070+-	0.00040	0.00000+-	0.09295	0.00+-	*****	0.0
C35	BR	0.00280+-	0.00040	0.00019+-	0.09295	0.07+-	33.20	0.0
C37	RB *	0.00030<	0.00040	0.00030<	0.09295	0.99<	*****	0.0
C38	SR *	0.00030<	0.00050	0.00025<	0.09295	0.82<	*****	0.0
C39	Y *	0.00060+-	0.00060	0.00000+-	0.09295	0.00+-	*****	0.0
C40	ZR *	0.00200+-	0.00070	0.00027+-	0.09295	0.14+-	46.48	0.0

C42	MO	*	0.00000<	0.00100	0.00000<	0.09295	0.00<	0.00	0.0
C46	PD	*	0.00000<	0.00280	0.00016<	0.09295	0.00<	0.00	0.0
C47	AG	*	0.00000<	0.00290	0.00028<	0.09295	0.00<	0.00	0.0
C48	CD	*	0.00000<	0.00310	0.00022<	0.09295	0.00<	0.00	0.0
C49	IN	*	0.00680+-	0.00340	0.00065+-	0.09295	0.10+-	-13.67	-0.1
C50	SN	*	0.00000<	0.00370	0.00000<	0.09296	0.00<	0.00	0.0
C51	SB	*	0.00000<	0.00410	0.00000<	0.09296	0.00<	0.00	0.0
C56	BA	*	0.00310+-	0.00190	0.00000+-	0.09304	0.00+-	-30.01	0.0
C57	LA	*	0.00000<	0.00150	0.00381<	0.09309	0.00<	0.00	0.0
C80	HG	*	0.00000<	0.00080	0.00000<	0.09295	0.00<	0.00	0.0
C82	PB	*	0.00670+-	0.00120	0.00070+-	0.09295	0.10+-	-13.87	-0.1
C200	TC		5.89260+-	0.44440	5.91490+-	1.53933	1.00+-	0.27	0.0
C201	OC	*	4.88560+-	0.34410	4.88838+-	1.49941	1.00+-	0.31	0.0
C202	EC	*	1.00870+-	0.15030	1.02652+-	0.36047	1.02+-	0.39	0.0
C203	SO4		1.18190+-	0.05910	0.03776+-	0.09349	0.03+-	0.08	-10.3
C204	NO3	*	0.59090+-	0.02960	0.65112+-	0.09997	1.10+-	0.18	0.6
C205	NH4	*	0.42860+-	0.02150	0.24313+-	0.09621	0.57+-	0.23	-1.9
C217	CL2		0.00000<	0.06240	0.03619<	0.09360	0.00<	0.00	0.3
C219	K2		0.08990+-	0.00450	0.05744+-	0.09419	0.64+-	1.05	-0.3
C300	F2		0.07620+-	0.00380	0.00000+-	0.00084	0.00+-	0.01	-19.6
C301	NA2		0.46610+-	0.02330	0.00000+-	0.00084	0.00+-	0.00	-20.0
C302	CA2		0.37000+-	0.01850	0.00000+-	0.00084	0.00+-	0.00	-20.0
C303	MG2		0.03870+-	0.00190	0.00000+-	0.00084	0.00+-	0.02	-18.6
C304	NA	*	0.12030+-	0.04750	0.00000+-	0.00084	0.00+-	0.01	-2.5
C305	CO	*	0.00000<	0.00180	0.00000<	0.00023	0.00<	0.00	0.0

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Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:     HELEN            BRITT & LUECKE:        No        INHELEN2.IN8  
SAMPLE DATE: 11/14/07    SOURCE ELIMINATION:   No        SOHAMIL3.SEL  
DURATION:   24            BEST FIT:               No        POHELEN2.txt  
START HOUR:  0                                    DSHELEN2.SEL  
SIZE:     FINE                                  ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.98	% MASS	103.3
CHI SQUARE	0.16	DEGREES FREEDOM	35

SOURCE CONTRIBUTION ESTIMATES:

SOURCE	EST CODE	NAME	SCE(µg/m³)	Std Err	Tstat
-----					
YES	HAML07	RDDST_HE	0.44584	0.09992	4.46187
YES	HAML11	S04_FZER	0.25458	0.03674	6.92908
YES	HAML13	NH4NO3F2	0.43498	0.04234	10.27476
YES	HAML26	GASEXST2	0.76392	0.37066	2.06097
YES	HAML54	RWC_F222	3.05840	0.49509	6.17740

-----  
4.95772

MEASURED CONCENTRATION FOR SIZE: FINE

4.8+- 0.0

Eligible Space Collinearity Display

=====  
=====

ELIGIBLE SPACE DIM. = 5 FOR MAX. UNC. = 0.96000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.03459 0.04233 0.09896 0.29458 0.54413

-----  
 NUMBER ESTIMABLE SOURCES = 5 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE  
 -----  
 1.0000 HAML07 1.0000 HAML11 1.0000 HAML13 1.0000 HAML26 1.0000 HAML54  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====  
 =====

SPECIES CONCENTRATIONS:

SPECIES	FIT	MEASURED	CALCULATED RESIDUAL		MEASURED	UNCERTAINTY
			CALCULATED	RESIDUAL		
TMAC	TMAU	4.80000+- 0.00010	4.95772+- 0.45362	1.03+- 0.09	0.3	
C12	MG *	0.00740+- 0.00580	0.00176+- 0.02548	0.24+- 3.45	-0.2	
C13	AL *	0.04030+- 0.00530	0.04109+- 0.02577	1.02+- 0.65	0.0	
C14	SI *	0.11380+- 0.00680	0.12464+- 0.02813	1.10+- 0.26	0.4	
C15	P *	0.00000< 0.00100	0.00463< 0.02548	0.00< 0.00	0.2	
C16	S *	0.10680+- 0.00710	0.10680+- 0.00911	1.00+- 0.11	0.0	
C17	CL	0.01250+- 0.00220	0.00905+- 0.02551	0.72+- 2.04	-0.1	
C19	K *	0.05200+- 0.00320	0.01828+- 0.02547	0.35+- 0.49	-1.3	
C20	CA *	0.04470+- 0.00870	0.03444+- 0.02564	0.77+- 0.59	-0.4	
C22	TI *	0.00310+- 0.00050	0.00180+- 0.02555	0.58+- 8.24	-0.1	
C23	V *	0.00000< 0.00030	0.00019< 0.02547	0.00< 0.00	0.0	
C24	CR *	0.00000< 0.00040	0.00041< 0.02546	0.00< 0.00	0.0	
C25	MN *	0.00050< 0.00060	0.00095< 0.02546	1.90< 50.97	0.0	
C26	FE *	0.07550+- 0.00400	0.03143+- 0.02700	0.42+- 0.36	-1.6	
C28	NI *	0.00170+- 0.00070	0.00011+- 0.02546	0.07+-14.98	-0.1	
C29	CU *	0.00520+- 0.00080	0.00199+- 0.02546	0.38+- 4.90	-0.1	
C30	ZN *	0.01230+- 0.00090	0.01163+- 0.02556	0.95+- 2.08	0.0	
C31	GA *	0.00000< 0.00040	0.00001< 0.02546	0.00< 0.00	0.0	
C32	GE *	0.00000< 0.00040	0.00000< 0.02546	0.00< 0.00	0.0	
C33	AS *	0.00110+- 0.00060	0.00152+- 0.02546	1.38+-23.16	0.0	
C34	SE *	0.00050+- 0.00030	0.00007+- 0.02546	0.14+-50.92	0.0	
C35	BR	0.00140+- 0.00030	0.00085+- 0.02546	0.60+-18.19	0.0	
C37	RB *	0.00000< 0.00030	0.00006< 0.02546	0.00< 0.00	0.0	
C38	SR *	0.00000< 0.00040	0.00023< 0.02546	0.00< 0.00	0.0	
C39	Y *	0.00000< 0.00050	0.00000< 0.02546	0.00< 0.00	0.0	

C40	ZR	*	0.00030<	0.00060	0.00016<	0.02546	0.54<	84.87	0.0
C42	MO	*	0.00000<	0.00080	0.00001<	0.02546	0.00<	0.00	0.0
C46	PD	*	0.00230<	0.00270	0.00007<	0.02547	0.03<	11.07	-0.1
C47	AG	*	0.00320+-	0.00280	0.00023+-	0.02547	0.07+-	7.96	-0.1
C48	CD	*	0.00190<	0.00280	0.00112<	0.02548	0.59<	13.44	0.0
C49	IN	*	0.00000<	0.00310	0.00001<	0.02548	0.00<	0.00	0.0
C50	SN	*	0.00000<	0.00340	0.00032<	0.02550	0.00<	0.00	0.0
C51	SB	*	0.00080<	0.00380	0.00082<	0.02552	1.03<	32.27	0.0
C56	BA	*	0.00110<	0.00150	0.00147<	0.02621	1.34<	23.90	0.0
C57	LA	*	0.00000<	0.00100	0.00007<	0.02671	0.00<	0.00	0.0
C80	HG	*	0.00000<	0.00070	0.00012<	0.02546	0.00<	0.00	0.0
C82	PB	*	0.00170+-	0.00100	0.01304+-	0.02550	7.67+-	15.67	0.4
C200	TC		3.13090+-	0.30610	3.19556+-	0.25204	1.02+-	0.13	0.2
C201	OC	*	2.79190+-	0.23930	2.80847+-	0.25868	1.01+-	0.13	0.0
C202	EC	*	0.33700+-	0.11670	0.38709+-	0.07009	1.15+-	0.45	0.4
C203	SO4		0.36270+-	0.01810	0.01320+-	0.02581	0.04+-	0.07	-11.1
C204	NO3	*	0.33780+-	0.01690	0.33864+-	0.03057	1.00+-	0.10	0.0
C205	NH4	*	0.09970+-	0.00500	0.09787+-	0.02728	0.98+-	0.28	-0.1
C217	CL2		0.07100+-	0.00360	0.00105+-	0.02548	0.01+-	0.36	-2.7
C219	K2		0.00000<	0.06230	0.00000<	0.02546	0.00<	0.00	0.0
C300	F2		0.08480+-	0.00420	0.00000+-	0.00032	0.00+-	0.00	-20.1
C301	NA2		0.49020+-	0.02440	0.00000+-	0.00032	0.00+-	0.00	-20.1
C302	CA2		0.32610+-	0.01630	0.00000+-	0.00032	0.00+-	0.00	-20.0
C303	MG2		0.03780+-	0.00190	0.00000+-	0.00032	0.00+-	0.01	-19.6
C304	NA	*	0.03050<	0.03840	0.00127<	0.00315	0.04<	0.12	-0.8
C305	CO	*	0.00000<	0.00140	0.00003<	0.00046	0.00<	0.00	0.0

---

Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

```

SAMPLE:           OPTIONS:           INPUT FILES:

SITE:   HELEN     BRITT & LUECKE:   No    INHELEN2.IN8
SAMPLE DATE: 11/20/07  SOURCE ELIMINATION: No    SOHAMIL3.SEL
DURATION:  24      BEST FIT:           No    POHELEN2.txt
START HOUR: 0              DSHELEN2.SEL
SIZE:     FINE              ADHELEN2.txt
                              PRHAMIL3.csv
  
```

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

```

      R SQUARE   0.94             % MASS   100.5
      CHI SQUARE   0.29          DEGREES FREEDOM   37
  
```

SOURCE CONTRIBUTION ESTIMATES:

```

SOURCE
EST CODE  NAME  SCE(µg/m³)  Std Err  Tstat
-----
YES HAML11 S04_FZER  1.54946  0.18598  8.33154
YES HAML13 NH4NO3F2  2.05327  0.23155  8.86733
YES HAML66 RSWDBRN7  14.38169  2.85141  5.04371
  
```

-----  
17.98442

MEASURED CONCENTRATION FOR SIZE: FINE

17.9+- 0.0

Eligible Space Collinearity Display

```

=====
ELIGIBLE SPACE DIM. = 3 FOR MAX. UNC. = 3.58000 (20.% OF TOTAL MEAS.
MASS)
  
```

1 / Singular Value

```

-----
0.18534  0.23152  2.85145
-----
  
```

NUMBER ESTIMABLE SOURCES = 3 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML66  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

=====

SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	17.90000+-	0.00010	17.98442+-	2.84752	1.00+-	0.16 0.0
C12	MG *	0.00000<	0.00640	0.00029<	0.15495	0.00<	0.00 0.0
C13	AL *	0.01880+-	0.00470	0.00178+-	0.15497	0.09+-	8.24 -0.1
C14	SI *	0.05140+-	0.00400	0.00354+-	0.15498	0.07+-	3.02 -0.3
C15	P *	0.00020<	0.00160	0.00019<	0.15495	0.93<	***** 0.0
C16	S *	0.54180+-	0.02890	0.54180+-	0.05454	1.00+-	0.11 0.0
C17	CL	0.02860+-	0.00320	0.01847+-	0.15547	0.65+-	5.44 -0.1
C19	K *	0.08520+-	0.00480	0.13434+-	0.22454	1.58+-	2.64 0.2
C20	CA *	0.03150+-	0.01040	0.00444+-	0.15502	0.14+-	4.92 -0.2
C22	TI *	0.00230+-	0.00050	0.00000+-	0.15495	0.00+-	67.37 0.0
C23	V *	0.00000<	0.00030	0.00000<	0.15495	0.00<	0.00 0.0
C24	CR *	0.00000<	0.00050	0.00000<	0.15495	0.00<	0.00 0.0
C25	MN *	0.00190+-	0.00060	0.00024+-	0.15495	0.13+-	81.55 0.0
C26	FE *	0.04030+-	0.00230	0.00240+-	0.15499	0.06+-	3.85 -0.2
C28	NI *	0.00060<	0.00070	0.00000<	0.15495	0.00<	***** 0.0
C29	CU *	0.02380+-	0.00160	0.00006+-	0.15495	0.00+-	6.51 -0.2
C30	ZN *	0.03110+-	0.00180	0.00433+-	0.15496	0.14+-	4.98 -0.2
C31	GA *	0.00000<	0.00050	0.00000<	0.15495	0.00<	0.00 0.0
C32	GE *	0.00000<	0.00040	0.00000<	0.15495	0.00<	0.00 0.0
C33	AS *	0.00000<	0.00090	0.00000<	0.15495	0.00<	0.00 0.0
C34	SE *	0.00000<	0.00030	0.00000<	0.15495	0.00<	0.00 0.0
C35	BR	0.00310+-	0.00040	0.00010+-	0.15495	0.03+-	49.98 0.0
C37	RB *	0.00030+-	0.00030	0.00009+-	0.15495	0.29+-	***** 0.0
C38	SR *	0.00020<	0.00040	0.00003<	0.15495	0.14<	***** 0.0
C39	Y *	0.00000<	0.00050	0.00000<	0.15495	0.00<	0.00 0.0
C40	ZR *	0.00000<	0.00060	0.00000<	0.15495	0.00<	0.00 0.0
C42	MO *	0.00000<	0.00080	0.00000<	0.15495	0.00<	0.00 0.0



C46	PD	*	0.00000<	0.00260	0.00004<	0.15495	0.00<	0.00	0.0
C47	AG	*	0.00210<	0.00280	0.00010<	0.15495	0.05<	73.78	0.0
C48	CD	*	0.00000<	0.00280	0.00009<	0.15495	0.00<	0.00	0.0
C49	IN	*	0.00090<	0.00310	0.00000<	0.15495	0.00<	*****	0.0
C50	SN	*	0.00400+-	0.00350	0.00019+-	0.15495	0.05+-	-38.74	0.0
C51	SB	*	0.00000<	0.00380	0.00000<	0.15495	0.00<	0.00	0.0
C56	BA	*	0.00000<	0.00160	0.00091<	0.15495	0.00<	0.00	0.0
C57	LA	*	0.00000<	0.00100	0.00338<	0.15498	0.00<	0.00	0.0
C80	HG	*	0.00060<	0.00080	0.00000<	0.15495	0.00<	*****	0.0
C82	PB	*	0.01240+-	0.00130	0.00000+-	0.15495	0.00+-	-12.50	-0.1
C200	TC		9.93760+-	0.64420	9.16985+-	1.79734	0.92+-	0.19	-0.4
C201	OC	*	9.08860+-	0.55430	7.38803+-	1.69287	0.81+-	0.19	-1.0
C202	EC	*	0.84390+-	0.14180	1.78182+-	0.62342	2.11+-	0.82	1.5
C203	SO4		1.86850+-	0.09360	0.13143+-	0.16434	0.07+-	0.09	-9.2
C204	NO3	*	1.44820+-	0.07240	1.60185+-	0.17425	1.11+-	0.13	0.8
C205	NH4	*	0.89890+-	0.04490	0.48026+-	0.16172	0.53+-	0.18	-2.5
C217	CL2		0.10490+-	0.00520	0.03706+-	0.15581	0.35+-	1.49	-0.4
C219	K2		0.10110+-	0.00510	0.20091+-	0.22744	1.99+-	2.25	0.4
C300	F2		0.10860+-	0.00540	0.00000+-	0.00146	0.00+-	0.01	-19.4
C301	NA2		0.59090+-	0.02960	0.00000+-	0.00146	0.00+-	0.00	-19.9
C302	CA2		0.39910+-	0.02000	0.00000+-	0.00146	0.00+-	0.00	-19.9
C303	MG2		0.05040+-	0.00250	0.00000+-	0.00146	0.00+-	0.03	-17.4
C304	NA	*	0.03790<	0.04700	0.00078<	0.00136	0.02<	0.04	-0.8
C305	CO	*	0.00000<	0.00140	0.00000<	0.00146	0.00<	0.00	0.0

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Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:

SITE:     HELEN        BRITT & LUECKE:     No     INHELEN2.IN8  
SAMPLE DATE: 11/26/07   SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
DURATION:   24        BEST FIT:            No     POHELEN2.txt  
START HOUR:  0                                DSHELEN2.SEL  
SIZE:     FINE                                ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.98	% MASS	101.7
CHI SQUARE	0.19	DEGREES FREEDOM	36

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE   NAME    SCE( $\mu\text{g}/\text{m}^3$ )   Std Err   Tstat

-----

YES HAML11	S04_FZER	0.33297	0.06979	4.77105
YES HAML13	NH4NO3F2	1.99506	0.12974	15.37686
YES HAML61	RSWDBRN2	11.10271	2.67906	4.14426
YES HAML73	CMNTKILN	0.60201	0.23216	2.59307

-----

14.03276

MEASURED CONCENTRATION FOR SIZE: FINE

13.8+- 0.0

Eligible Space Collinearity Display

=====

ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 2.76000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----

0.05019  0.12967  0.23659  2.67911

-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML61 1.0000 HAML73  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

-----  
 =====  
 =====  
 SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	13.80000+-	0.00010	14.03276+-	2.66592	1.02+-	0.19 0.1
C12	MG *	0.00630+-	0.00600	0.00144+-	0.03332	0.23+-	5.29 -0.1
C13	AL *	0.00920+-	0.00430	0.02577+-	0.03340	2.80+-	3.86 0.5
C14	SI *	0.06500+-	0.00450	0.05269+-	0.03375	0.81+-	0.52 -0.4
C15	P *	0.00670+-	0.00130	0.00010+-	0.03331	0.02+-	4.97 -0.2
C16	S *	0.15960+-	0.00990	0.15960+-	0.01391	1.00+-	0.11 0.0
C17	CL	0.01950+-	0.00270	0.01329+-	0.03333	0.68+-	1.71 -0.2
C19	K *	0.08620+-	0.00490	0.04692+-	0.03482	0.54+-	0.41 -1.1
C20	CA *	0.03830+-	0.01040	0.06565+-	0.03539	1.71+-	1.03 0.7
C22	TI *	0.00330+-	0.00050	0.00179+-	0.03333	0.54+-	10.10 0.0
C23	V *	0.00000<	0.00030	0.00006<	0.03330	0.00<	0.00 0.0
C24	CR *	0.00000<	0.00050	0.00016<	0.03330	0.00<	0.00 0.0
C25	MN *	0.00000<	0.00060	0.00037<	0.03330	0.00<	0.00 0.0
C26	FE *	0.05260+-	0.00290	0.00600+-	0.03331	0.11+-	0.63 -1.4
C28	NI *	0.00150+-	0.00070	0.00056+-	0.03330	0.37+-	22.20 0.0
C29	CU *	0.00650+-	0.00080	0.00014+-	0.03330	0.02+-	5.12 -0.2
C30	ZN *	0.02970+-	0.00170	0.00236+-	0.03330	0.08+-	1.12 -0.8
C31	GA *	0.00000<	0.00050	0.00000<	0.03330	0.00<	0.00 0.0
C32	GE *	0.00100+-	0.00040	0.00000+-	0.03332	0.00+-	33.32 0.0
C33	AS *	0.00110+-	0.00070	0.00002+-	0.03330	0.02+-	30.27 0.0
C34	SE *	0.00000<	0.00030	0.00006<	0.03330	0.00<	0.00 0.0
C35	BR	0.00210+-	0.00030	0.00012+-	0.03330	0.06+-	15.86 -0.1
C37	RB *	0.00040+-	0.00030	0.00045+-	0.03330	1.13+-	83.25 0.0
C38	SR *	0.00000<	0.00040	0.00019<	0.03330	0.00<	0.00 0.0
C39	Y *	0.00000<	0.00050	0.00000<	0.03330	0.00<	0.00 0.0
C40	ZR *	0.00040<	0.00060	0.00000<	0.03330	0.00<	83.24 0.0

C42	MO	*	0.00050<	0.00080	0.00010<	0.03330	0.19<	66.60	0.0
C46	PD	*	0.00010<	0.00270	0.00003<	0.03330	0.30<	*****	0.0
C47	AG	*	0.00160<	0.00280	0.00004<	0.03330	0.02<	20.82	0.0
C48	CD	*	0.00000<	0.00290	0.00010<	0.03331	0.00<	0.00	0.0
C49	IN	*	0.00000<	0.00310	0.00004<	0.03331	0.00<	0.00	0.0
C50	SN	*	0.00180<	0.00350	0.00002<	0.03332	0.01<	18.51	-0.1
C51	SB	*	0.00000<	0.00380	0.00000<	0.03333	0.00<	0.00	0.0
C56	BA	*	0.00030<	0.00160	0.00020<	0.03363	0.68<	*****	0.0
C57	LA	*	0.00110+-	0.00110	0.00014+-	0.03375	0.13+-	30.68	0.0
C80	HG	*	0.00170+-	0.00070	0.00001+-	0.03330	0.00+-	19.59	-0.1
C82	PB	*	0.00450+-	0.00100	0.01096+-	0.03334	2.43+-	7.43	0.2
C200	TC		8.54290+-	0.57450	7.84176+-	2.09585	0.92+-	0.25	-0.3
C201	OC	*	7.44380+-	0.47250	6.47341+-	2.04141	0.87+-	0.28	-0.5
C202	EC	*	1.06910+-	0.15340	1.40206+-	0.47580	1.31+-	0.48	0.7
C203	SO4		0.60780+-	0.03050	0.12192+-	0.05131	0.20+-	0.09	-8.1
C204	NO3	*	1.50710+-	0.07540	1.56046+-	0.08568	1.04+-	0.08	0.5
C205	NH4	*	0.50790+-	0.02540	0.45451+-	0.05606	0.89+-	0.12	-0.9
C217	CL2		0.07240+-	0.00360	0.00012+-	0.03330	0.00+-	0.46	-2.2
C219	K2		0.09240+-	0.00460	0.01206+-	0.03360	0.13+-	0.36	-2.4
C300	F2		0.10740+-	0.00540	0.00120+-	0.00114	0.01+-	0.01	-19.2
C301	NA2		0.52460+-	0.02620	0.00000+-	0.00113	0.00+-	0.00	-20.0
C302	CA2		0.43300+-	0.02160	0.00000+-	0.00113	0.00+-	0.00	-20.0
C303	MG2		0.03990+-	0.00200	0.00000+-	0.00113	0.00+-	0.03	-17.4
C304	NA	*	0.00780<	0.04130	0.01379<	0.00299	1.77<	9.37	0.1
C305	CO	*	0.00000<	0.00140	0.00060<	0.00064	0.00<	0.00	0.4

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Chemical Mass Balance Version EPA-CMB8.2

Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:

SITE:     HELEN            BRITT & LUECKE:        No        INHELEN2.IN8

SAMPLE DATE: 12/2/07       SOURCE ELIMINATION:   No        SOHAMIL3.SEL

DURATION:   24            BEST FIT:               No        POHELEN2.txt

START HOUR:  0                                 DSHELEN2.SEL

SIZE:        FINE                              ADHELEN2.txt

   PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.97	% MASS	98.6
CHI SQUARE	0.21	DEGREES FREEDOM	36

SOURCE CONTRIBUTION ESTIMATES:

SOURCE				
EST CODE	NAME	SCE(µg/m <sup>3</sup> )	Std Err	Tstat
-----				
YES HAML11	S04_FZER	0.82183	0.09460	8.68727
YES HAML13	NH4NO3F2	2.37129	0.18073	13.12054
YES HAML60	RSWDBRN1	6.37247	1.60965	3.95892

-----  
9.56559

MEASURED CONCENTRATION FOR SIZE: FINE

9.7+- 0.0

Eligible Space Collinearity Display

=====

ELIGIBLE SPACE DIM. = 3 FOR MAX. UNC. = 1.94000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.09448  0.18070  1.60966  
-----

NUMBER ESTIMABLE SOURCES = 3 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML60  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

=====

SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	9.70000+-	0.00010	9.56559+-	1.61450	0.99+-	0.17 -0.1
C12	MG *	0.00280<	0.00560	0.00000<	0.08218	0.00<	29.35 0.0
C13	AL	0.01490+-	0.00430	0.00000+-	0.08218	0.00+-	5.52 -0.2
C14	SI *	0.04870+-	0.00370	0.00166+-	0.08219	0.03+-	1.69 -0.6
C15	P *	0.00160+-	0.00120	0.00000+-	0.08218	0.00+-	51.36 0.0
C16	S *	0.27990+-	0.01570	0.27990+-	0.02727	1.00+-	0.11 0.0
C17	CL	0.00000<	0.00220	0.01119<	0.08238	0.00<	0.00 0.1
C19	K *	0.09380+-	0.00530	0.01899+-	0.08392	0.20+-	0.89 -0.9
C20	CA *	0.01910+-	0.01170	0.00350+-	0.08228	0.18+-	4.31 -0.2
C22	TI *	0.00140+-	0.00040	0.00000+-	0.08219	0.00+-	58.70 0.0
C23	V *	0.00010<	0.00030	0.00000<	0.08218	0.00<	***** 0.0
C24	CR *	0.00000<	0.00040	0.00000<	0.08218	0.00<	0.00 0.0
C25	MN *	0.00150+-	0.00060	0.00013+-	0.08218	0.08+-	54.79 0.0
C26	FE *	0.01990+-	0.00150	0.00023+-	0.08218	0.01+-	4.13 -0.2
C28	NI *	0.00240+-	0.00070	0.00000+-	0.08218	0.00+-	34.24 0.0
C29	CU *	0.00190+-	0.00070	0.00000+-	0.08218	0.00+-	43.25 0.0
C30	ZN *	0.01470+-	0.00100	0.00202+-	0.08221	0.14+-	5.59 -0.2
C31	GA *	0.00100+-	0.00050	0.00000+-	0.08218	0.00+-	82.18 0.0
C32	GE *	0.00050+-	0.00040	0.00000+-	0.08218	0.00+-	***** 0.0
C33	AS *	0.00070+-	0.00060	0.00000+-	0.08218	0.00+-	***** 0.0
C34	SE *	0.00030+-	0.00030	0.00000+-	0.08218	0.00+-	***** 0.0
C35	BR	0.00140+-	0.00030	0.00011+-	0.08218	0.08+-	58.70 0.0
C37	RB *	0.00020<	0.00030	0.00000<	0.08218	0.00<	***** 0.0
C38	SR *	0.00000<	0.00040	0.00000<	0.08218	0.00<	0.00 0.0
C39	Y *	0.00000<	0.00050	0.00000<	0.08218	0.00<	0.00 0.0
C40	ZR *	0.00100+-	0.00060	0.00000+-	0.08218	0.00+-	82.18 0.0
C42	MO *	0.00070<	0.00090	0.00000<	0.08218	0.00<	***** 0.0

C46	PD	*	0.00000<	0.00270	0.00000<	0.08218	0.00<	0.00	0.0
C47	AG	*	0.00000<	0.00280	0.00000<	0.08218	0.00<	0.00	0.0
C48	CD	*	0.00230<	0.00290	0.00000<	0.08218	0.00<	35.73	0.0
C49	IN	*	0.00000<	0.00320	0.00000<	0.08218	0.00<	0.00	0.0
C50	SN	*	0.00000<	0.00360	0.00000<	0.08219	0.00<	0.00	0.0
C51	SB	*	0.00000<	0.00390	0.00000<	0.08219	0.00<	0.00	0.0
C56	BA	*	0.00250+-	0.00150	0.00000+-	0.08222	0.00+-	-32.89	0.0
C57	LA	*	0.00000<	0.00090	0.00000<	0.08224	0.00<	0.00	0.0
C80	HG	*	0.00030<	0.00070	0.00000<	0.08218	0.00<	*****	0.0
C82	PB	*	0.00160+-	0.00100	0.00000+-	0.08218	0.00+-	-51.36	0.0
C200	TC		4.82930+-	0.39170	4.50109+-	1.09584	0.93+-	0.24	-0.3
C201	OC	*	4.51290+-	0.32520	3.51591+-	1.01275	0.78+-	0.23	-0.9
C202	EC	*	0.32170+-	0.11590	0.98518+-	0.42659	3.06+-	1.73	1.5
C203	SO4		0.89930+-	0.04500	0.01417+-	0.08304	0.02+-	0.09	-9.4
C204	NO3	*	1.78180+-	0.08910	1.84705+-	0.12359	1.04+-	0.09	0.4
C205	NH4	*	0.64110+-	0.03210	0.53810+-	0.09804	0.84+-	0.16	-1.0
C217	CL2		0.00000<	0.06240	0.00011<	0.08218	0.00<	0.00	0.0
C219	K2		0.08740+-	0.00440	0.01568+-	0.08335	0.18+-	0.95	-0.9
C300	F2		0.08370+-	0.00420	0.00000+-	0.00068	0.00+-	0.01	-19.7
C301	NA2		0.49130+-	0.02460	0.00000+-	0.00068	0.00+-	0.00	-20.0
C302	CA2		0.35970+-	0.01800	0.00000+-	0.00068	0.00+-	0.00	-20.0
C303	MG2		0.03610+-	0.00180	0.00000+-	0.00068	0.00+-	0.02	-18.7
C304	NA	*	0.05720+-	0.04090	0.00000+-	0.00068	0.00+-	0.01	-1.4
C305	CO	*	0.00000<	0.00140	0.00000<	0.00025	0.00<	0.00	0.0

-----

Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:     HELEN            BRITT & LUECKE:     No     INHELEN2.IN8  
SAMPLE DATE: 12/8/07     SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
DURATION:   24            BEST FIT:            No     POHELEN2.txt  
START HOUR:  0                                    DSHELEN2.SEL  
SIZE:     FINE                                    ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.96	% MASS	99.9
CHI SQUARE	0.40	DEGREES FREEDOM	35

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE   NAME    SCE( $\mu\text{g}/\text{m}^3$ )   Std Err   Tstat  
-----  
YES HAML05 RDDST\_BT   0.22357   0.07492   2.98428  
YES HAML11 S04\_FZER   0.24933   0.03165   7.87658  
YES HAML13 NH4NO3F2   0.78796   0.06061   13.00141  
YES HAML54 RWC\_F222   4.33083   0.54269   7.98025

-----  
5.59169

MEASURED CONCENTRATION FOR SIZE: FINE

5.6+- 0.0

Eligible Space Collinearity Display

=====  
ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 1.12000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.03147  0.06061  0.07495  0.54270  
-----



NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML05 1.0000 HAML11 1.0000 HAML13 1.0000 HAML54  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

=====

SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL

-----  
 SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU		5.60000+- 0.00010	5.59169+- 0.54815	1.00+- 0.10	0.0
C12	MG	*	0.00000< 0.00560	0.00000< 0.02493	0.00< 0.00	0.0
C13	AL		0.02220+- 0.00450	0.03038+- 0.02512	1.37+- 1.16	0.3
C14	SI	*	0.07390+- 0.00490	0.08005+- 0.02613	1.08+- 0.36	0.2
C15	P	*	0.00150+- 0.00110	0.00124+- 0.02493	0.82+-16.63	0.0
C16	S	*	0.09150+- 0.00650	0.09150+- 0.00823	1.00+- 0.11	0.0
C17	CL		0.00550+- 0.00210	0.00842+- 0.02493	1.53+- 4.57	0.1
C19	K	*	0.03680+- 0.00250	0.02066+- 0.02494	0.56+- 0.68	-0.6
C20	CA	*	0.03270+- 0.00780	0.01429+- 0.02495	0.44+- 0.77	-0.7
C22	TI	*	0.00300+- 0.00050	0.00096+- 0.02494	0.32+- 8.31	-0.1
C23	V	*	0.00000< 0.00040	0.00009< 0.02493	0.00< 0.00	0.0
C24	CR	*	0.00020< 0.00050	0.00009< 0.02493	0.44< *****	0.0
C25	MN	*	0.00070+- 0.00060	0.00054+- 0.02493	0.77+-35.62	0.0
C26	FE	*	0.02900+- 0.00180	0.01021+- 0.02495	0.35+- 0.86	-0.8
C28	NI	*	0.00170+- 0.00070	0.00003+- 0.02493	0.02+-14.67	-0.1
C29	CU	*	0.00200+- 0.00070	0.00074+- 0.02493	0.37+-12.47	-0.1
C30	ZN	*	0.00990+- 0.00080	0.00181+- 0.02493	0.18+- 2.52	-0.3
C31	GA	*	0.00010< 0.00050	0.00000< 0.02493	0.00< *****	0.0
C32	GE	*	0.00000< 0.00040	0.00000< 0.02493	0.00< 0.00	0.0
C33	AS	*	0.00040< 0.00070	0.00004< 0.02493	0.11< 62.33	0.0
C34	SE	*	0.00000< 0.00030	0.00003< 0.02493	0.00< 0.00	0.0
C35	BR		0.00130+- 0.00030	0.00008+- 0.02493	0.06+-19.18	0.0
C37	RB	*	0.00000< 0.00030	0.00007< 0.02493	0.00< 0.00	0.0
C38	SR	*	0.00050+- 0.00040	0.00025+- 0.02493	0.50+-49.87	0.0
C39	Y	*	0.00040< 0.00050	0.00000< 0.02493	0.00< 62.33	0.0
C40	ZR	*	0.00110+- 0.00060	0.00022+- 0.02493	0.20+-22.67	0.0

C42	MO	*	0.00000<	0.00090	0.00000<	0.02493	0.00<	0.00	0.0
C46	PD	*	0.00160<	0.00270	0.00004<	0.02493	0.03<	15.58	-0.1
C47	AG	*	0.00000<	0.00280	0.00000<	0.02493	0.00<	0.00	0.0
C48	CD	*	0.00180<	0.00290	0.00000<	0.02493	0.00<	13.85	-0.1
C49	IN	*	0.00090<	0.00320	0.00000<	0.02493	0.00<	27.70	0.0
C50	SN	*	0.00250<	0.00360	0.00000<	0.02493	0.00<	9.97	-0.1
C51	SB	*	0.00000<	0.00390	0.00050<	0.02494	0.00<	0.00	0.0
C56	BA	*	0.00060<	0.00160	0.00112<	0.02496	1.86<	41.89	0.0
C57	LA	*	0.00000<	0.00110	0.00000<	0.02493	0.00<	0.00	0.0
C80	HG	*	0.00030<	0.00080	0.00004<	0.02493	0.13<	83.11	0.0
C82	PB	*	0.00130+-	0.00100	0.00083+-	0.02493	0.64+-	19.19	0.0
C200	TC		3.63200+-	0.33170	3.65089+-	0.35197	1.01+-	0.13	0.0
C201	OC	*	3.45210+-	0.27280	3.50797+-	0.35168	1.02+-	0.13	0.1
C202	EC	*	0.18080+-	0.10890	0.14292+-	0.02874	0.79+-	0.50	-0.3
C203	SO4		0.44130+-	0.02210	0.00000+-	0.02493	0.00+-	0.06	-13.2
C204	NO3	*	0.69110+-	0.03450	0.61067+-	0.03945	0.88+-	0.07	-1.5
C205	NH4	*	0.08120+-	0.00410	0.17729+-	0.03060	2.18+-	0.39	3.1
C217	CL2		0.38220+-	0.01910	0.00000+-	0.02493	0.00+-	0.07	-12.2
C219	K2		0.56200+-	0.02810	0.00000+-	0.02493	0.00+-	0.04	-15.0
C300	F2		0.38970+-	0.01950	0.00000+-	0.00044	0.00+-	0.00	-20.0
C301	NA2		2.83930+-	0.14200	0.00000+-	0.00044	0.00+-	0.00	-20.0
C302	CA2		0.63280+-	0.03170	0.00000+-	0.00044	0.00+-	0.00	-20.0
C303	MG2		0.08370+-	0.00420	0.00000+-	0.00044	0.00+-	0.01	-19.8
C304	NA	*	0.00000<	0.01750	0.00000<	0.00044	0.00<	0.00	0.0
C305	CO	*	0.00000<	0.00150	0.00000<	0.00044	0.00<	0.00	0.0

---



0.02985 0.04524 0.08189 0.18624 0.35671 0.72691

-----  
 NUMBER ESTIMABLE SOURCES = 6 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE  
 -----  
 1.0000 HAML06 1.0000 HAML11 1.0000 HAML13 1.0000 HAML20 1.0000 HAML54  
 1.0000 HAML73  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====  
 =====

SPECIES CONCENTRATIONS:

SPECIES	FIT	MEASURED	CALCULATED RESIDUAL		UNCERTAINTY
			CALCULATED	MEASURED	
TMAC	TMAU	6.90000+- 0.00010	6.94141+- 0.53014	1.01+- 0.08	0.1
C12	MG *	0.00000< 0.00610	0.00491< 0.01395	0.00< 0.00	0.3
C13	AL	0.04170+- 0.00540	0.05692+- 0.01551	1.37+- 0.41	0.9
C14	SI *	0.12530+- 0.00740	0.13865+- 0.01916	1.11+- 0.17	0.7
C15	P *	0.00610+- 0.00120	0.00359+- 0.01392	0.59+- 2.29	-0.2
C16	S *	0.08560+- 0.00630	0.08560+- 0.00797	1.00+- 0.12	0.0
C17	CL	0.01470+- 0.00240	0.04690+- 0.01392	3.19+- 1.08	2.3
C19	K *	0.04640+- 0.00300	0.04325+- 0.01557	0.93+- 0.34	-0.2
C20	CA *	0.06790+- 0.00960	0.06120+- 0.01536	0.90+- 0.26	-0.4
C22	TI *	0.00370+- 0.00050	0.00343+- 0.01392	0.93+- 3.76	0.0
C23	V *	0.00020< 0.00030	0.00016< 0.01391	0.79< 69.58	0.0
C24	CR *	0.00000< 0.00040	0.00032< 0.01391	0.00< 0.00	0.0
C25	MN *	0.00020< 0.00060	0.00082< 0.01391	4.12< 70.66	0.0
C26	FE *	0.06100+- 0.00330	0.02364+- 0.01410	0.39+- 0.23	-2.6
C28	NI *	0.00170+- 0.00070	0.00112+- 0.01392	0.66+- 8.19	0.0
C29	CU *	0.00680+- 0.00080	0.01858+- 0.01391	2.73+- 2.07	0.8
C30	ZN *	0.02690+- 0.00160	0.02004+- 0.01392	0.74+- 0.52	-0.5
C31	GA *	0.00000< 0.00050	0.00000< 0.01391	0.00< 0.00	0.0
C32	GE *	0.00000< 0.00040	0.00000< 0.01391	0.00< 0.00	0.0
C33	AS *	0.00000< 0.00070	0.00020< 0.01391	0.00< 0.00	0.0
C34	SE *	0.00000< 0.00030	0.00007< 0.01391	0.00< 0.00	0.0
C35	BR	0.00150+- 0.00030	0.00080+- 0.01391	0.54+- 9.28	0.0
C37	RB *	0.00090+- 0.00030	0.00041+- 0.01391	0.45+-15.46	0.0

C38	SR	*	0.00040+-	0.00040	0.00035+-	0.01391	0.87+-	-34.79	0.0
C39	Y	*	0.00020<	0.00050	0.00000<	0.01391	0.00<	69.57	0.0
C40	ZR	*	0.00010<	0.00060	0.00019<	0.01391	1.85<	*****	0.0
C42	MO	*	0.00020<	0.00090	0.00007<	0.01391	0.37<	69.59	0.0
C46	PD	*	0.00070<	0.00280	0.00002<	0.01391	0.03<	19.88	0.0
C47	AG	*	0.00300+-	0.00280	0.00003+-	0.01391	0.01+-	4.64	-0.2
C48	CD	*	0.00000<	0.00290	0.00021<	0.01392	0.00<	0.00	0.0
C49	IN	*	0.00000<	0.00310	0.00003<	0.01391	0.00<	0.00	0.0
C50	SN	*	0.00550+-	0.00360	0.00006+-	0.01391	0.01+-	2.53	-0.4
C51	SB	*	0.00000<	0.00390	0.00035<	0.01392	0.00<	0.00	0.0
C56	BA	*	0.00200+-	0.00160	0.00309+-	0.01396	1.55+-	7.09	0.1
C57	LA	*	0.00190+-	0.00110	0.00011+-	0.01391	0.06+-	7.32	-0.1
C80	HG	*	0.00000<	0.00080	0.00004<	0.01391	0.00<	0.00	0.0
C82	PB	*	0.00450+-	0.00110	0.01360+-	0.01398	3.02+-	3.19	0.6
C200	TC		4.32560+-	0.36620	3.12622+-	0.30095	0.72+-	0.09	-2.5
C201	OC	*	3.83180+-	0.29180	3.84950+-	0.30080	1.00+-	0.11	0.0
C202	EC	*	0.49040+-	0.12440	0.48916+-	0.01868	1.00+-	0.26	0.0
C203	SO4		0.40970+-	0.02050	0.14262+-	0.03268	0.35+-	0.08	-6.9
C204	NO3	*	0.48290+-	0.02410	0.47186+-	0.02613	0.98+-	0.07	-0.3
C205	NH4	*	0.00000<	0.06240	0.12825<	0.01893	0.00<	0.00	2.0
C217	CL2		0.18860+-	0.00940	0.00000+-	0.01391	0.00+-	0.07	-11.2
C219	K2		0.18980+-	0.00950	0.00000+-	0.01391	0.00+-	0.07	-11.3
C300	F2		0.15360+-	0.00770	0.00092+-	0.00043	0.01+-	0.00	-19.8
C301	NA2		2.88090+-	0.14400	0.00000+-	0.00041	0.00+-	0.00	-20.0
C302	CA2		0.57870+-	0.02890	0.00000+-	0.00041	0.00+-	0.00	-20.0
C303	MG2		0.07450+-	0.00370	0.00000+-	0.00041	0.00+-	0.01	-20.0
C304	NA	*	0.00000<	0.01810	0.01058<	0.00216	0.00<	0.00	0.6
C305	CO	*	0.00000<	0.00150	0.00046<	0.00062	0.00<	0.00	0.3

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Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:     HELEN            BRITT & LUECKE:        No        INHELEN2.IN8  
SAMPLE DATE: 12/20/07    SOURCE ELIMINATION:   No        SOHAMIL3.SEL  
DURATION:   24            BEST FIT:               No        POHELEN2.txt  
START HOUR:  0                                    DSHELEN2.SEL  
SIZE:     FINE                                  ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.98	% MASS	118.2
CHI SQUARE	0.16	DEGREES FREEDOM	32

SOURCE CONTRIBUTION ESTIMATES:

SOURCE	EST CODE	NAME	SCE( $\mu\text{g}/\text{m}^3$ )	Std Err	Tstat
-----					
YES	HAML11	S04_FZER	0.09765	0.01545	6.31870
YES	HAML13	NH4NO3F2	0.31521	0.02574	12.24448
YES	HAML64	RSWDBRN5	2.77726	0.30613	9.07224
YES	HAML75	SOILDUST	0.11924	0.02117	5.63120

-----  
3.30936

MEASURED CONCENTRATION FOR SIZE: FINE

2.8+- 0.0

Eligible Space Collinearity Display

=====  
ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 0.56000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.01544 0.02117 0.02574 0.30613  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML64 1.0000 HAML75  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

=====

SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL

-----  
 SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU	2.80000+-	0.00010	3.30936+-	0.30685	1.18+-	0.11	1.7
C12	MG *	0.00000<	0.00530	0.00238<	0.00980	0.00<	0.00	0.2
C13	AL *	0.01700+-	0.00410	0.02146+-	0.00984	1.26+-	0.65	0.4
C14	SI *	0.06030+-	0.00420	0.05850+-	0.01005	0.97+-	0.18	-0.2
C15	P *	0.00090<	0.00100	0.00000<	0.00977	0.00<	10.85	-0.1
C16	S *	0.03500+-	0.00400	0.03500+-	0.00323	1.00+-	0.15	0.0
C17	CL	0.00460+-	0.00200	0.00295+-	0.00977	0.64+-	2.14	-0.2
C19	K	0.02460+-	0.00190	0.00771+-	0.00977	0.31+-	0.40	-1.7
C20	CA	0.03120+-	0.00780	0.00225+-	0.00977	0.07+-	0.31	-2.3
C22	TI *	0.00320+-	0.00050	0.00091+-	0.00977	0.28+-	3.05	-0.2
C23	V *	0.00000<	0.00030	0.00004<	0.00977	0.00<	0.00	0.0
C24	CR *	0.00000<	0.00040	0.00002<	0.00976	0.00<	0.00	0.0
C25	MN *	0.00060+-	0.00060	0.00033+-	0.00976	0.56+-	16.28	0.0
C26	FE	0.06060+-	0.00330	0.01017+-	0.00978	0.17+-	0.16	-4.9
C28	NI *	0.00200+-	0.00070	0.00000+-	0.00976	0.00+-	4.88	-0.2
C29	CU *	0.00580+-	0.00080	0.00006+-	0.00976	0.01+-	1.68	-0.6
C30	ZN	0.01450+-	0.00100	0.00038+-	0.00976	0.03+-	0.67	-1.4
C31	GA *	0.00000<	0.00050	0.00000<	0.00976	0.00<	0.00	0.0
C32	GE *	0.00040+-	0.00040	0.00000+-	0.00977	0.00+-	24.42	0.0
C33	AS *	0.00000<	0.00060	0.00000<	0.00976	0.00<	0.00	0.0
C34	SE *	0.00040+-	0.00030	0.00000+-	0.00976	0.00+-	24.41	0.0
C35	BR	0.00070+-	0.00030	0.00002+-	0.00976	0.03+-	13.95	-0.1
C37	RB *	0.00010<	0.00030	0.00001<	0.00976	0.08<	97.65	0.0
C38	SR *	0.00000<	0.00040	0.00000<	0.00976	0.00<	0.00	0.0
C39	Y *	0.00000<	0.00050	0.00000<	0.00976	0.00<	0.00	0.0
C40	ZR *	0.00030<	0.00060	0.00000<	0.00976	0.00<	32.55	0.0

C42	MO	*	0.00010<	0.00090	0.00000<	0.00976	0.00<	97.65	0.0
C46	PD	*	0.00000<	0.00270	0.00000<	0.00977	0.00<	0.00	0.0
C47	AG	*	0.00000<	0.00280	0.00002<	0.00977	0.00<	0.00	0.0
C48	CD	*	0.00130<	0.00290	0.00000<	0.00977	0.00<	7.51	-0.1
C49	IN	*	0.00000<	0.00310	0.00002<	0.00977	0.00<	0.00	0.0
C50	SN	*	0.00100<	0.00350	0.00006<	0.00977	0.06<	9.77	-0.1
C51	SB	*	0.00340<	0.00390	0.00001<	0.00977	0.00<	2.87	-0.3
C56	BA	*	0.00210+-	0.00150	0.00015+-	0.00978	0.07+-	4.66	-0.2
C57	LA	*	0.00000<	0.00100	0.00016<	0.00978	0.00<	0.00	0.0
C80	HG	*	0.00070+-	0.00070	0.00000+-	0.00976	0.00+-	13.95	-0.1
C82	PB	*	0.00230+-	0.00100	0.00010+-	0.00977	0.04+-	4.25	-0.2
C200	TC		2.62280+-	0.28130	2.60225+-	0.15153	0.99+-	0.12	-0.1
C201	OC	*	2.29310+-	0.21430	2.09100+-	0.14831	0.91+-	0.11	-0.8
C202	EC	*	0.33270+-	0.11640	0.51125+-	0.03259	1.54+-	0.55	1.5
C203	SO4		0.26350+-	0.01320	0.00415+-	0.00977	0.02+-	0.04	-15.8
C204	NO3	*	0.24980+-	0.01250	0.24773+-	0.01565	0.99+-	0.08	-0.1
C205	NH4	*	0.00000<	0.06240	0.07190<	0.01207	0.00<	0.00	1.1
C217	CL2		0.09740+-	0.00490	0.00003+-	0.00977	0.00+-	0.10	-8.9
C219	K2		0.07370+-	0.00370	0.00463+-	0.00977	0.06+-	0.13	-6.6
C300	F2		0.11740+-	0.00590	0.00000+-	0.00028	0.00+-	0.00	-19.9
C301	NA2		2.67280+-	0.13360	0.00000+-	0.00028	0.00+-	0.00	-20.0
C302	CA2		0.54950+-	0.02740	0.00000+-	0.00028	0.00+-	0.00	-20.1
C303	MG2		0.07740+-	0.00390	0.00000+-	0.00028	0.00+-	0.00	-19.8
C304	NA	*	0.00000<	0.01630	0.00119<	0.00037	0.00<	0.00	0.1
C305	CO	*	0.00000<	0.00150	0.00000<	0.00004	0.00<	0.00	0.0

---



Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:     HELEN        BRITT & LUECKE:     No     INHELEN2.IN8  
SAMPLE DATE: 12/26/07   SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
DURATION:   24        BEST FIT:            No     POHELEN2.txt  
START HOUR:  0                                DSHELEN2.SEL  
SIZE:     FINE                                ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

      R SQUARE    0.92                    % MASS    103.8  
      CHI SQUARE   0.77                    DEGREES FREEDOM    36

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE   NAME    SCE( $\mu\text{g}/\text{m}^3$ )   Std Err    Tstat  
-----  
YES HAML11 S04\_FZER   0.10903   0.01709   6.37880  
YES HAML13 NH4NO3F2   0.35152   0.02866   12.26724  
YES HAML64 RSWDBRN5   2.53371   0.29088   8.71058  
YES HAML75 SOILDUST   0.12026   0.02292   5.24737

-----  
                  3.11453

MEASURED CONCENTRATION FOR SIZE: FINE

3.0+- 0.0

Eligible Space Collinearity Display

=====  
=====  
ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 0.60000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.01708 0.02292 0.02865 0.29088  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML64 1.0000 HAML75  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

SPECIES CONCENTRATIONS:

SPECIES	FIT	CALCULATED		RESIDUAL		UNCERTAINTY
		MEASURED	MEASURED	CALCULATED	MEASURED	
TMAC	TMAU	3.00000+-	0.00010	3.11453+-	0.29224	1.04+- 0.10 0.4
C12	MG *	0.01920+-	0.00980	0.00241+-	0.01094	0.13+- 0.57 -1.1
C13	AL *	0.02020+-	0.00470	0.02165+-	0.01097	1.07+- 0.60 0.1
C14	SI *	0.05180+-	0.00430	0.05888+-	0.01117	1.14+- 0.24 0.6
C15	P *	0.00580+-	0.00130	0.00000+-	0.01090	0.00+- 1.88 -0.5
C16	S *	0.03860+-	0.00440	0.03860+-	0.00360	1.00+- 0.15 0.0
C17	CL	0.02290+-	0.00260	0.00270+-	0.01090	0.12+- 0.48 -1.8
C19	K *	0.02520+-	0.00200	0.00726+-	0.01090	0.29+- 0.43 -1.6
C20	CA *	0.02970+-	0.00210	0.00226+-	0.01090	0.08+- 0.37 -2.5
C22	TI *	0.00250+-	0.00050	0.00091+-	0.01090	0.37+- 4.36 -0.1
C23	V *	0.00070+-	0.00030	0.00004+-	0.01090	0.05+-15.58 -0.1
C24	CR *	0.00120+-	0.00040	0.00002+-	0.01090	0.02+- 9.09 -0.1
C25	MN *	0.00210+-	0.00060	0.00034+-	0.01090	0.16+- 5.19 -0.2
C26	FE *	0.03410+-	0.00200	0.01026+-	0.01092	0.30+- 0.32 -2.1
C28	NI *	0.00080<	0.00110	0.00000<	0.01090	0.00< 13.63 -0.1
C29	CU *	0.00230+-	0.00090	0.00006+-	0.01090	0.03+- 4.74 -0.2
C30	ZN *	0.01780+-	0.00150	0.00035+-	0.01090	0.02+- 0.61 -1.6
C31	GA *	0.00160+-	0.00060	0.00000+-	0.01090	0.00+- 6.81 -0.1
C32	GE *	0.00050+-	0.00050	0.00000+-	0.01091	0.00+-21.81 0.0
C33	AS *	0.00000<	0.00080	0.00000<	0.01090	0.00< 0.00 0.0
C34	SE *	0.00000<	0.00040	0.00000<	0.01090	0.00< 0.00 0.0
C35	BR	0.00290+-	0.00050	0.00002+-	0.01090	0.01+- 3.76 -0.3
C37	RB *	0.00030<	0.00050	0.00001<	0.01090	0.03< 36.34 0.0
C38	SR *	0.00110+-	0.00070	0.00000+-	0.01090	0.00+- 9.91 -0.1
C39	Y *	0.00000<	0.00080	0.00000<	0.01090	0.00< 0.00 0.0
C40	ZR *	0.00000<	0.00100	0.00000<	0.01090	0.00< 0.00 0.0

C42	MO	*	0.00000<	0.00150	0.00000<	0.01090	0.00<	0.00	0.0
C46	PD	*	0.00000<	0.00240	0.00000<	0.01090	0.00<	0.00	0.0
C47	AG	*	0.00000<	0.00240	0.00002<	0.01090	0.00<	0.00	0.0
C48	CD	*	0.00000<	0.00230	0.00000<	0.01090	0.00<	0.00	0.0
C49	IN	*	0.00000<	0.00270	0.00002<	0.01090	0.00<	0.00	0.0
C50	SN	*	0.00230<	0.00350	0.00005<	0.01090	0.02<	4.74	-0.2
C51	SB	*	0.00590+-	0.00370	0.00001+-	0.01090	0.00+-	1.85	-0.5
C56	BA	*	0.00360+-	0.00170	0.00014+-	0.01091	0.04+-	3.03	-0.3
C57	LA	*	0.00100<	0.00160	0.00014<	0.01092	0.14<	10.92	-0.1
C80	HG	*	0.00210+-	0.00110	0.00000+-	0.01090	0.00+-	5.19	-0.2
C82	PB	*	0.00450+-	0.00140	0.00010+-	0.01090	0.02+-	2.42	-0.4
C200	TC		2.37700+-	0.26870	2.37405+-	0.13839	1.00+-	0.13	0.0
C201	OC	*	2.15230+-	0.20720	1.90763+-	0.13545	0.89+-	0.11	-1.0
C202	EC	*	0.22770+-	0.11140	0.46642+-	0.03039	2.05+-	1.01	2.1
C203	SO4		0.23350+-	0.01170	0.00378+-	0.01091	0.02+-	0.05	-14.4
C204	NO3	*	0.27840+-	0.01390	0.27556+-	0.01746	0.99+-	0.08	-0.1
C205	NH4	*	0.00000<	0.06240	0.07998<	0.01347	0.00<	0.00	1.3
C217	CL2		0.12110+-	0.00610	0.00003+-	0.01091	0.00+-	0.09	-9.7
C219	K2		0.07740+-	0.00390	0.00423+-	0.01090	0.05+-	0.14	-6.3
C300	F2		0.10740+-	0.00540	0.00000+-	0.00026	0.00+-	0.00	-19.9
C301	NA2		2.78820+-	0.13940	0.00000+-	0.00026	0.00+-	0.00	-20.0
C302	CA2		0.50770+-	0.02550	0.00000+-	0.00026	0.00+-	0.00	-19.9
C303	MG2		0.06910+-	0.00350	0.00000+-	0.00026	0.00+-	0.00	-19.7
C304	NA	*	0.05040+-	0.03220	0.00120+-	0.00035	0.02+-	0.02	-1.5
C305	CO	*	0.00000<	0.00130	0.00000<	0.00004	0.00<	0.00	0.0

---

Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:     HELEN            BRITT & LUECKE:        No     INHELEN2.IN8  
SAMPLE DATE: 1/1/08       SOURCE ELIMINATION:    No     SOHAMIL3.SEL  
DURATION:   24            BEST FIT:                No     POHELEN2.txt  
START HOUR:  0                                        DSHELEN2.SEL  
SIZE:     FINE                                        ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.97	% MASS	100.0
CHI SQUARE	0.24	DEGREES FREEDOM	32

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE   NAME    SCE( $\mu\text{g}/\text{m}^3$ )   Std Err   Tstat  
-----  
YES HAML08 RDDST\_MS   0.33537   0.11244   2.98257  
YES HAML11 S04\_FZER   0.26039   0.03188   8.16803  
YES HAML13 NH4NO3F2   0.57365   0.05238   10.95201  
YES HAML54 RWC\_F222   3.43128   0.45009   7.62350

-----  
4.60069

MEASURED CONCENTRATION FOR SIZE: FINE

4.6+- 0.0

Eligible Space Collinearity Display

=====  
ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 0.92000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.03182 0.05238 0.11235 0.45012  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML08 1.0000 HAML11 1.0000 HAML13 1.0000 HAML54  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL

-----  
 SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU		4.60000+- 0.00010	4.60069+- 0.46179	1.00+- 0.10	0.0
C12	MG	*	0.02000+- 0.01020	0.00335+- 0.02604	0.17+- 1.30	-0.6
C13	AL	*	0.03550+- 0.00560	0.02734+- 0.02625	0.77+- 0.75	-0.3
C14	SI	*	0.07740+- 0.00560	0.08151+- 0.02792	1.05+- 0.37	0.1
C15	P	*	0.00560+- 0.00120	0.00025+- 0.02604	0.05+- 4.65	-0.2
C16	S	*	0.09160+- 0.00620	0.09160+- 0.00859	1.00+- 0.12	0.0
C17	CL		0.01970+- 0.00260	0.00647+- 0.02604	0.33+- 1.32	-0.5
C19	K		0.22470+- 0.01170	0.01988+- 0.02609	0.09+- 0.12	-7.2
C20	CA		0.04700+- 0.00270	0.01004+- 0.02604	0.21+- 0.55	-1.4
C22	TI	*	0.00000< 0.00060	0.00103< 0.02604	0.00< 0.00	0.0
C23	V	*	0.00000< 0.00040	0.00002< 0.02604	0.00< 0.00	0.0
C24	CR	*	0.00000< 0.00040	0.00002< 0.02604	0.00< 0.00	0.0
C25	MN	*	0.00100+- 0.00060	0.00030+- 0.02604	0.30+-26.04	0.0
C26	FE		0.03980+- 0.00230	0.01111+- 0.02607	0.28+- 0.66	-1.1
C28	NI	*	0.00030< 0.00100	0.00000< 0.02604	0.01< 86.80	0.0
C29	CU	*	0.00220+- 0.00080	0.00037+- 0.02604	0.17+-11.84	-0.1
C30	ZN		0.01380+- 0.00130	0.00113+- 0.02604	0.08+- 1.89	-0.5
C31	GA	*	0.00020< 0.00060	0.00000< 0.02604	0.00< *****	0.0
C32	GE	*	0.00080+- 0.00050	0.00000+- 0.02604	0.00+-32.55	0.0
C33	AS	*	0.00000< 0.00080	0.00000< 0.02604	0.00< 0.00	0.0
C34	SE	*	0.00080+- 0.00040	0.00002+- 0.02604	0.03+-32.55	0.0
C35	BR		0.00170+- 0.00040	0.00007+- 0.02604	0.04+-15.32	-0.1
C37	RB	*	0.00000< 0.00050	0.00006< 0.02604	0.00< 0.00	0.0
C38	SR	*	0.00140+- 0.00070	0.00014+- 0.02604	0.10+-18.60	0.0
C39	Y	*	0.00000< 0.00080	0.00000< 0.02604	0.00< 0.00	0.0
C40	ZR	*	0.00000< 0.00100	0.00017< 0.02604	0.00< 0.00	0.0

C42	MO	*	0.00160+-	0.00140	0.00000+-	0.02604	0.00+-	16.27	-0.1
C46	PD	*	0.00000<	0.00240	0.00000<	0.02604	0.00<	0.00	0.0
C47	AG	*	0.00120<	0.00250	0.00000<	0.02604	0.00<	21.70	0.0
C48	CD	*	0.00000<	0.00250	0.00000<	0.02604	0.00<	0.00	0.0
C49	IN	*	0.00180<	0.00280	0.00000<	0.02604	0.00<	14.47	-0.1
C50	SN	*	0.00000<	0.00340	0.00000<	0.02604	0.00<	0.00	0.0
C51	SB	*	0.00000<	0.00360	0.00024<	0.02604	0.00<	0.00	0.0
C56	BA	*	0.01010+-	0.00190	0.00089+-	0.02605	0.09+-	2.58	-0.4
C57	LA	*	0.00000<	0.00160	0.00000<	0.02604	0.00<	0.00	0.0
C80	HG	*	0.00150+-	0.00110	0.00003+-	0.02604	0.02+-	17.36	-0.1
C82	PB	*	0.00390+-	0.00130	0.00078+-	0.02604	0.20+-	6.68	-0.1
C200	TC		2.98750+-	0.29930	2.89257+-	0.27938	0.97+-	0.13	-0.2
C201	OC	*	2.77270+-	0.23880	2.81288+-	0.27915	1.01+-	0.13	0.1
C202	EC	*	0.21180+-	0.11040	0.11793+-	0.02839	0.56+-	0.32	-0.8
C203	SO4		0.42460+-	0.02120	0.00000+-	0.02604	0.00+-	0.06	-12.6
C204	NO3	*	0.45800+-	0.02290	0.44458+-	0.03426	0.97+-	0.09	-0.3
C205	NH4	*	0.00000<	0.06240	0.12907<	0.02907	0.00<	0.00	1.9
C217	CL2		0.09990+-	0.00500	0.00000+-	0.02604	0.00+-	0.26	-3.8
C219	K2		0.17360+-	0.00870	0.00000+-	0.02604	0.00+-	0.15	-6.3
C300	F2		0.10870+-	0.00540	0.00000+-	0.00035	0.00+-	0.00	-20.1
C301	NA2		2.66440+-	0.13320	0.00000+-	0.00035	0.00+-	0.00	-20.0
C302	CA2		0.52040+-	0.02600	0.00000+-	0.00035	0.00+-	0.00	-20.0
C303	MG2		0.07870+-	0.00400	0.00000+-	0.00035	0.00+-	0.00	-19.6
C304	NA	*	0.02210+-	0.01340	0.00000+-	0.00035	0.00+-	0.02	-1.6
C305	CO	*	0.00000<	0.00130	0.00000<	0.00035	0.00<	0.00	0.0

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Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/25/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:

SITE:     HELEN        BRITT & LUECKE:     No     INHELEN2.IN8  
SAMPLE DATE: 1/7/08     SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
DURATION:   24        BEST FIT:            No     POHELEN2.txt  
START HOUR:  0                                DSHELEN2.SEL  
SIZE:     FINE                                ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.96	% MASS	100.0
CHI SQUARE	0.36	DEGREES FREEDOM	28

SOURCE CONTRIBUTION ESTIMATES:

SOURCE	EST CODE	NAME	SCE( $\mu\text{g}/\text{m}^3$ )	Std Err	Tstat
-----					
YES	HAML11	S04_FZER	0.16203	0.02590	6.25574
YES	HAML13	NH4NO3F2	0.97483	0.09930	9.81724
YES	HAML17	LDV_DS2F	0.57996	0.23863	2.43040
YES	HAML54	RWC_F222	8.38427	1.04330	8.03632

-----  
10.10109

MEASURED CONCENTRATION FOR SIZE: FINE

10.1+- 0.0

Eligible Space Collinearity Display

=====  
=====

ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 2.02000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.02539 0.09930 0.22349 1.04666  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML17 1.0000 HAML54  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====  
 =====

SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	10.10000+-	0.00010	10.10109+-	0.98880	1.00+-	0.10 0.0
C12	MG *	0.00000<	0.00540	0.00000<	0.06022	0.00<	0.00 0.0
C13	AL *	0.00730+-	0.00440	0.00048+-	0.01621	0.07+-	2.22 -0.4
C14	SI *	0.03510+-	0.00350	0.00444+-	0.01621	0.13+-	0.46 -1.8
C15	P *	0.01460+-	0.00160	0.00077+-	0.01621	0.05+-	1.11 -0.8
C16	S *	0.06950+-	0.00640	0.06950+-	0.00553	1.00+-	0.12 0.0
C17	CL	0.04490+-	0.00350	0.01576+-	0.01621	0.35+-	0.36 -1.8
C19	K	0.08030+-	0.00460	0.02981+-	0.01621	0.37+-	0.20 -3.0
C20	CA	0.04380+-	0.00250	0.01074+-	0.01621	0.25+-	0.37 -2.0
C22	TI *	0.00490+-	0.00060	0.00039+-	0.01622	0.08+-	3.31 -0.3
C23	V *	0.00000<	0.00040	0.00005<	0.01621	0.00<	0.00 0.0
C24	CR *	0.00000<	0.00040	0.00004<	0.01620	0.00<	0.00 0.0
C25	MN *	0.00180+-	0.00060	0.00049+-	0.01620	0.27+-	9.00 -0.1
C26	FE	0.07560+-	0.00400	0.00094+-	0.01620	0.01+-	0.21 -4.5
C28	NI *	0.00120+-	0.00100	0.00001+-	0.01620	0.01+-	13.50 -0.1
C29	CU *	0.00750+-	0.00110	0.00001+-	0.01620	0.00+-	2.16 -0.5
C30	ZN	0.04080+-	0.00260	0.00264+-	0.01620	0.06+-	0.40 -2.3
C31	GA	0.00080+-	0.00060	0.00000+-	0.01620	0.00+-	20.25 0.0
C32	GE	0.00060+-	0.00050	0.00000+-	0.06022	0.00+-	***** 0.0
C33	AS	0.00120+-	0.00050	0.00001+-	0.01620	0.01+-	13.50 -0.1
C34	SE	0.00050+-	0.00040	0.00005+-	0.01620	0.10+-	32.41 0.0
C35	BR	0.00220+-	0.00050	0.00017+-	0.01620	0.08+-	7.37 -0.1
C37	RB *	0.00100+-	0.00050	0.00014+-	0.01620	0.14+-	16.20 -0.1
C38	SR *	0.00110+-	0.00070	0.00035+-	0.01620	0.32+-	14.73 0.0
C39	Y *	0.00000<	0.00080	0.00000<	0.01620	0.00<	0.00 0.0
C40	ZR *	0.00170+-	0.00100	0.00042+-	0.01621	0.25+-	9.54 -0.1



C42	MO	*	0.00000<	0.00150	0.00000<	0.01620	0.00<	0.00	0.0
C46	PD	*	0.00000<	0.00230	0.00000<	0.01620	0.00<	0.00	0.0
C47	AG	*	0.00230<	0.00240	0.00000<	0.01620	0.00<	7.04	-0.1
C48	CD	*	0.00540+-	0.00250	0.00000+-	0.01621	0.00+-	3.00	-0.3
C49	IN	*	0.00000<	0.00270	0.00000<	0.01620	0.00<	0.00	0.0
C50	SN	*	0.00020<	0.00340	0.00000<	0.01620	0.00<	81.02	0.0
C51	SB	*	0.00000<	0.00350	0.00059<	0.01622	0.00<	0.00	0.0
C56	BA	*	0.00510+-	0.00200	0.00216+-	0.01635	0.42+-	3.21	-0.2
C57	LA	*	0.00000<	0.00180	0.00000<	0.01621	0.00<	0.00	0.0
C80	HG	*	0.00140+-	0.00110	0.00008+-	0.01621	0.05+-	11.58	-0.1
C82	PB	*	0.00240+-	0.00130	0.00098+-	0.01621	0.41+-	6.76	-0.1
C200	TC		7.64040+-	0.53430	7.68331+-	0.68122	1.01+-	0.11	0.0
C201	OC	*	6.99130+-	0.45030	7.04272+-	0.67943	1.01+-	0.12	0.1
C202	EC	*	0.63920+-	0.13180	0.64058+-	0.05196	1.00+-	0.22	0.0
C203	SO4		0.32210+-	0.01610	0.00000+-	0.06022	0.00+-	0.19	-5.2
C204	NO3	*	0.81560+-	0.04080	0.75549+-	0.07111	0.93+-	0.10	-0.7
C205	NH4	*	0.09240+-	0.00460	0.21934+-	0.06409	2.37+-	0.70	2.0
C217	CL2		0.14230+-	0.00710	0.00000+-	0.06022	0.00+-	0.42	-2.3
C219	K2		0.12230+-	0.00610	0.00000+-	0.06022	0.00+-	0.49	-2.0
C300	F2		0.13110+-	0.00660	0.00000+-	0.00085	0.00+-	0.01	-19.7
C301	NA2		2.85480+-	0.14270	0.00000+-	0.00085	0.00+-	0.00	-20.0
C302	CA2		0.50350+-	0.02520	0.00000+-	0.00085	0.00+-	0.00	-20.0
C303	MG2		0.06530+-	0.00330	0.00000+-	0.00085	0.00+-	0.01	-19.2
C304	NA	*	0.01240<	0.01420	0.00000<	0.00085	0.00<	0.07	-0.9
C305	CO	*	0.00000<	0.00140	0.00000<	0.00085	0.00<	0.00	0.0

---

Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:     HELEN            BRITT & LUECKE:     No     INHELEN2.IN8  
SAMPLE DATE: 1/13/08     SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
DURATION:  24            BEST FIT:            No     POHELEN2.txt  
START HOUR: 0                 DSHELEN2.SEL  
SIZE:     FINE                         ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.94	% MASS	106.7
CHI SQUARE	0.33	DEGREES FREEDOM	36

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE   NAME    SCE( $\mu\text{g}/\text{m}^3$ )   Std Err   Tstat  
-----  
YES HAML07 RDDST\_HE  0.11786  0.03555  3.31506  
YES HAML11 S04\_FZER  0.09399  0.01587  5.92112  
YES HAML13 NH4NO3F2  0.12150  0.01513  8.02987  
YES HAML62 RSWDBRN3  2.54701  0.35752  7.12411

-----  
2.88037

MEASURED CONCENTRATION FOR SIZE: FINE

2.7+- 0.0

Eligible Space Collinearity Display

=====  
ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 0.54000 (20.% OF TOTAL MEAS. MASS)  
=====

1 / Singular Value

-----  
0.01506  0.01567  0.03564  0.35752  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML07 1.0000 HAML11 1.0000 HAML13 1.0000 HAML62  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL

-----  
 SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU		2.70000+-	0.00010	2.88037+-	0.35751	1.07+-	0.13	0.5
C12	MG	*	0.00000<	0.00490	0.00000<	0.00940	0.00<	0.00	0.0
C13	AL	*	0.00340+-	0.00280	0.01040+-	0.00946	3.06+-	3.75	0.7
C14	SI	*	0.02770+-	0.00310	0.03108+-	0.00990	1.12+-	0.38	0.3
C15	P	*	0.00170+-	0.00100	0.00034+-	0.00940	0.20+-	5.53	-0.1
C16	S	*	0.03530+-	0.00420	0.03530+-	0.00312	1.00+-	0.15	0.0
C17	CL		0.00600+-	0.00190	0.00373+-	0.00940	0.62+-	1.58	-0.2
C19	K	*	0.01530+-	0.00150	0.00492+-	0.00940	0.32+-	0.62	-1.1
C20	CA	*	0.01690+-	0.00130	0.00710+-	0.00943	0.42+-	0.56	-1.0
C22	TI	*	0.00140+-	0.00040	0.00041+-	0.00940	0.29+-	6.72	-0.1
C23	V	*	0.00060+-	0.00030	0.00002+-	0.00940	0.04+-	15.67	-0.1
C24	CR	*	0.00010<	0.00040	0.00000<	0.00940	0.00<	93.99	0.0
C25	MN	*	0.00000<	0.00060	0.00017<	0.00940	0.00<	0.00	0.0
C26	FE	*	0.01750+-	0.00130	0.00460+-	0.00941	0.26+-	0.54	-1.4
C28	NI	*	0.00040<	0.00100	0.00000<	0.00940	0.00<	23.50	0.0
C29	CU	*	0.00160+-	0.00090	0.00045+-	0.00940	0.28+-	5.88	-0.1
C30	ZN	*	0.00470+-	0.00090	0.00175+-	0.00940	0.37+-	2.00	-0.3
C31	GA	*	0.00000<	0.00060	0.00000<	0.00940	0.00<	0.00	0.0
C32	GE	*	0.00050+-	0.00050	0.00000+-	0.00940	0.00+-	18.81	-0.1
C33	AS	*	0.00000<	0.00080	0.00040<	0.00940	0.00<	0.00	0.0
C34	SE	*	0.00000<	0.00040	0.00001<	0.00940	0.00<	0.00	0.0
C35	BR		0.00020<	0.00040	0.00015<	0.00940	0.76<	47.02	0.0
C37	RB	*	0.00000<	0.00050	0.00000<	0.00940	0.00<	0.00	0.0
C38	SR	*	0.00040<	0.00060	0.00002<	0.00940	0.06<	23.50	0.0
C39	Y	*	0.00000<	0.00080	0.00000<	0.00940	0.00<	0.00	0.0
C40	ZR	*	0.00010<	0.00100	0.00000<	0.00940	0.00<	93.99	0.0

C42	MO	*	0.00000< 0.00140	0.00000< 0.00940	0.00< 0.00	0.0
C46	PD	*	0.00000< 0.00230	0.00000< 0.00940	0.00< 0.00	0.0
C47	AG	*	0.00000< 0.00240	0.00002< 0.00940	0.00< 0.00	0.0
C48	CD	*	0.00000< 0.00240	0.00027< 0.00940	0.00< 0.00	0.0
C49	IN	*	0.00000< 0.00270	0.00001< 0.00940	0.00< 0.00	0.0
C50	SN	*	0.00000< 0.00330	0.00010< 0.00940	0.00< 0.00	0.0
C51	SB	*	0.00420+- 0.00350	0.00014+- 0.00940	0.03+- 2.24	-0.4
C56	BA	*	0.00530+- 0.00170	0.00044+- 0.00942	0.08+- 1.78	-0.5
C57	LA	*	0.00000< 0.00150	0.00018< 0.00942	0.00< 0.00	0.0
C80	HG	*	0.00000< 0.00110	0.00002< 0.00940	0.00< 0.00	0.0
C82	PB	*	0.00400+- 0.00130	0.00291+- 0.00940	0.73+- 2.36	-0.1
C200	TC		1.51310+- 0.22520	1.57738+- 0.10612	1.04+- 0.17	0.3
C201	OC	*	1.43320+- 0.17180	1.38831+- 0.10560	0.97+- 0.14	-0.2
C202	EC	*	0.07640< 0.10390	0.18907< 0.01414	2.47< 3.37	1.1
C203	SO4		0.23350+- 0.01170	0.00276+- 0.00941	0.01+- 0.04	-15.4
C204	NO3	*	0.10240+- 0.00510	0.10211+- 0.01052	1.00+- 0.11	0.0
C205	NH4	*	0.00000< 0.06240	0.02879< 0.00979	0.00< 0.00	0.5
C217	CL2		0.13110+- 0.00660	0.00003+- 0.00940	0.00+- 0.07	-11.4
C219	K2		0.13480+- 0.00670	0.00266+- 0.00940	0.02+- 0.07	-11.4
C300	F2		0.13610+- 0.00680	0.00000+- 0.00026	0.00+- 0.00	-20.0
C301	NA2		2.51350+- 0.12570	0.00000+- 0.00026	0.00+- 0.00	-20.0
C302	CA2		0.48270+- 0.02410	0.00000+- 0.00026	0.00+- 0.00	-20.0
C303	MG2		0.06780+- 0.00340	0.00000+- 0.00026	0.00+- 0.00	-19.9
C304	NA	*	0.06580+- 0.02940	0.00000+- 0.00026	0.00+- 0.00	-2.2
C305	CO	*	0.00000< 0.00120	0.00000< 0.00002	0.00< 0.00	0.0

---

Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:      HELEN            BRITT & LUECKE:      No            INHELEN2.IN8  
SAMPLE DATE: 1/19/08      SOURCE ELIMINATION:    No            SOHAMIL3.SEL  
DURATION:    24            BEST FIT:            No            POHELEN2.txt  
START HOUR:   0                                    DSHELEN2.SEL  
SIZE:      FINE                                    ADHELEN2.txt  
   PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.97	% MASS	100.8
CHI SQUARE	0.24	DEGREES FREEDOM	37

SOURCE CONTRIBUTION ESTIMATES:

SOURCE EST CODE	NAME	SCE(µg/m³)	Std Err	Tstat
YES HAML11	S04_FZER	0.48646	0.05791	8.40086
YES HAML13	NH4NO3F2	3.64891	0.23489	15.53471
YES HAML60	RSWDBRN1	6.24616	1.56601	3.98858

-----  
10.38154

MEASURED CONCENTRATION FOR SIZE: FINE

10.3+- 0.0

Eligible Space Collinearity Display

=====  
ELIGIBLE SPACE DIM. = 3 FOR MAX. UNC. = 2.06000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.05772 0.23486 1.56602  
-----

NUMBER ESTIMABLE SOURCES = 3 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML60  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

=====

SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	10.30000+-	0.00010	10.38154+-	1.57657	1.01+-	0.15 0.1
C12	MG *	0.00000<	0.00570	0.00000<	0.04865	0.00<	0.00 0.0
C13	AL *	0.00350+-	0.00290	0.00000+-	0.04865	0.00+-	-13.90 -0.1
C14	SI *	0.05390+-	0.00730	0.00163+-	0.04867	0.03+-	0.90 -1.1
C15	P *	0.00000<	0.00120	0.00000<	0.04865	0.00<	0.00 0.0
C16	S *	0.16810+-	0.01020	0.16810+-	0.01629	1.00+-	0.11 0.0
C17	CL	0.01620+-	0.00250	0.01097+-	0.04896	0.68+-	3.02 -0.1
C19	K *	0.03810+-	0.00250	0.01861+-	0.05142	0.49+-	1.35 -0.4
C20	CA *	0.01370+-	0.00120	0.00343+-	0.04881	0.25+-	3.56 -0.2
C22	TI *	0.00190+-	0.00050	0.00000+-	0.04865	0.00+-	-25.61 0.0
C23	V *	0.00090+-	0.00030	0.00000+-	0.04865	0.00+-	-54.05 0.0
C24	CR *	0.00000<	0.00050	0.00000<	0.04865	0.00<	0.00 0.0
C25	MN *	0.00050<	0.00060	0.00012<	0.04865	0.25<	97.29 0.0
C26	FE *	0.01880+-	0.00150	0.00022+-	0.04865	0.01+-	2.59 -0.4
C28	NI *	0.00340+-	0.00070	0.00000+-	0.04865	0.00+-	-14.31 -0.1
C29	CU *	0.00440+-	0.00080	0.00000+-	0.04865	0.00+-	-11.06 -0.1
C30	ZN *	0.00760+-	0.00080	0.00198+-	0.04869	0.26+-	6.41 -0.1
C31	GA *	0.00050+-	0.00050	0.00000+-	0.04865	0.00+-	-97.29 0.0
C32	GE *	0.00040+-	0.00040	0.00000+-	0.04865	0.00+-	***** 0.0
C33	AS *	0.00070+-	0.00070	0.00000+-	0.04865	0.00+-	-69.49 0.0
C34	SE *	0.00040+-	0.00030	0.00000+-	0.04865	0.00+-	***** 0.0
C35	BR	0.00090+-	0.00030	0.00011+-	0.04865	0.12+-	-54.05 0.0
C37	RB *	0.00010<	0.00030	0.00000<	0.04865	0.00<	***** 0.0
C38	SR *	0.00050+-	0.00040	0.00000+-	0.04865	0.00+-	-97.29 0.0
C39	Y *	0.00050+-	0.00050	0.00000+-	0.04865	0.00+-	-97.29 0.0
C40	ZR *	0.00000<	0.00060	0.00000<	0.04865	0.00<	0.00 0.0
C42	MO *	0.00000<	0.00090	0.00000<	0.04865	0.00<	0.00 0.0

C46	PD	*	0.00120<	0.00270	0.00000<	0.04865	0.00<	40.54	0.0
C47	AG	*	0.00090<	0.00280	0.00000<	0.04865	0.00<	54.05	0.0
C48	CD	*	0.00190<	0.00300	0.00000<	0.04865	0.00<	25.60	0.0
C49	IN	*	0.00190<	0.00320	0.00000<	0.04865	0.00<	25.60	0.0
C50	SN	*	0.00000<	0.00360	0.00000<	0.04865	0.00<	0.00	0.0
C51	SB	*	0.00000<	0.00390	0.00000<	0.04865	0.00<	0.00	0.0
C56	BA	*	0.00190+-	0.00140	0.00000+-	0.04871	0.00+-	-25.64	0.0
C57	LA	*	0.00140+-	0.00090	0.00000+-	0.04874	0.00+-	-34.81	0.0
C80	HG	*	0.00050<	0.00080	0.00000<	0.04865	0.00<	97.29	0.0
C82	PB	*	0.00140+-	0.00100	0.00000+-	0.04865	0.00+-	-34.75	0.0
C200	TC		4.81480+-	0.39050	4.41187+-	1.07220	0.92+-	0.23	-0.4
C201	OC	*	4.53600+-	0.32660	3.44622+-	0.99059	0.76+-	0.23	-1.0
C202	EC	*	0.27720+-	0.11390	0.96565+-	0.41318	3.48+-	2.07	1.6
C203	SO4		0.68250+-	0.03420	0.01389+-	0.05002	0.02+-	0.07	-11.0
C204	NO3	*	3.05040+-	0.15270	2.83703+-	0.14988	0.93+-	0.07	-1.0
C205	NH4	*	0.66170+-	0.03310	0.82547+-	0.09550	1.25+-	0.16	1.6
C217	CL2		0.10360+-	0.00520	0.00011+-	0.04865	0.00+-	0.47	-2.1
C219	K2		0.09990+-	0.00500	0.01537+-	0.05052	0.15+-	0.51	-1.7
C300	F2		0.11490+-	0.00570	0.00000+-	0.00073	0.00+-	0.01	-20.0
C301	NA2		2.68830+-	0.13440	0.00000+-	0.00073	0.00+-	0.00	-20.0
C302	CA2		0.51600+-	0.02590	0.00000+-	0.00073	0.00+-	0.00	-19.9
C303	MG2		0.06620+-	0.00330	0.00000+-	0.00073	0.00+-	0.01	-19.6
C304	NA	*	0.00000<	0.02580	0.00000<	0.00073	0.00<	0.00	0.0
C305	CO	*	0.00000<	0.00140	0.00000<	0.00037	0.00<	0.00	0.0

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Chemical Mass Balance Version EPA-CMB8.2

Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:  
  
SITE:      HELEN        BRITT & LUECKE:      No      INHELEN2.IN8  
SAMPLE DATE: 1/25/08    SOURCE ELIMINATION:   No      SOHAMIL3.SEL  
DURATION:   24         BEST FIT:                No      POHELEN2.txt  
START HOUR:  0                                DSHELEN2.SEL  
SIZE:       FINE                               ADHELEN2.txt  
  PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.99	% MASS	101.0
CHI SQUARE	0.09	DEGREES FREEDOM	37

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE   NAME   SCE(μg/m<sup>3</sup>)   Std Err   Tstat  
-----  
YES HAML11 S04\_FZER   1.60788   0.19011   8.45778  
YES HAML13 NH4NO3F2   16.26690   0.99721   16.31244  
YES HAML56 RWC\_COMP   28.59699   7.15722   3.99555

-----  
46.47178

MEASURED CONCENTRATION FOR SIZE: FINE

46.0+- 0.0

Eligible Space Collinearity Display

=====  
ELIGIBLE SPACE DIM. = 3 FOR MAX. UNC. = 9.20000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.18613  0.99721  7.15732  
-----



NUMBER ESTIMABLE SOURCES = 3 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML56  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====

SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	46.00000+-	0.00010	46.47178+-	7.19045	1.01+-	0.16 0.1
C12	MG *	0.00000<	0.00830	0.02002<	0.16089	0.00<	0.00 0.1
C13	AL *	0.00240<	0.00390	0.00572<	0.16081	2.38<	67.12 0.0
C14	SI *	0.03700+-	0.00300	0.00000+-	0.16081	0.00+-	4.35 -0.2
C15	P *	0.00000<	0.00190	0.00000<	0.16081	0.00<	0.00 0.0
C16	S *	0.58690+-	0.03150	0.58690+-	0.05337	1.00+-	0.11 0.0
C17	CL	0.09900+-	0.00650	0.14584+-	0.16102	1.47+-	1.63 0.3
C19	K *	0.15550+-	0.00840	0.24593+-	0.16081	1.58+-	1.04 0.6
C20	CA *	0.04640+-	0.00310	0.02002+-	0.16081	0.43+-	3.47 -0.2
C22	TI *	0.00020<	0.00060	0.00000<	0.16081	0.00<	***** 0.0
C23	V *	0.00000<	0.00030	0.00000<	0.16081	0.00<	0.00 0.0
C24	CR *	0.00020<	0.00050	0.00000<	0.16081	0.00<	***** 0.0
C25	MN *	0.00300+-	0.00070	0.00000+-	0.16081	0.00+-	-53.60 0.0
C26	FE *	0.07260+-	0.00390	0.00000+-	0.16081	0.00+-	2.22 -0.5
C28	NI *	0.01590+-	0.00120	0.00000+-	0.16081	0.00+-	-10.11 -0.1
C29	CU *	0.06260+-	0.00530	0.00000+-	0.16081	0.00+-	2.57 -0.4
C30	ZN *	0.10880+-	0.00840	0.01144+-	0.16081	0.11+-	1.48 -0.6
C31	GA *	0.00000<	0.00050	0.00000<	0.16081	0.00<	0.00 0.0
C32	GE *	0.00000<	0.00040	0.00000<	0.16081	0.00<	0.00 0.0
C33	AS *	0.00020<	0.00120	0.00000<	0.16081	0.00<	***** 0.0
C34	SE *	0.00010<	0.00040	0.00000<	0.16081	0.00<	***** 0.0
C35	BR	0.00660+-	0.00050	0.00000+-	0.16081	0.00+-	-24.37 0.0
C37	RB *	0.00040+-	0.00040	0.00000+-	0.16081	0.00+-	***** 0.0
C38	SR *	0.00080+-	0.00040	0.00000+-	0.16081	0.00+-	***** 0.0
C39	Y *	0.00000<	0.00050	0.00000<	0.16081	0.00<	0.00 0.0
C40	ZR *	0.00090+-	0.00060	0.00000+-	0.16081	0.00+-	***** 0.0
C42	MO *	0.00270+-	0.00090	0.00000+-	0.16081	0.00+-	-59.56 0.0

C46	PD	*	0.00020<	0.00270	0.00000<	0.16081	0.00<	*****	0.0
C47	AG	*	0.00000<	0.00280	0.00000<	0.16081	0.00<	0.00	0.0
C48	CD	*	0.00000<	0.00300	0.00000<	0.16081	0.00<	0.00	0.0
C49	IN	*	0.00520+-	0.00320	0.00000+-	0.16081	0.00+	-30.93	0.0
C50	SN	*	0.00740+-	0.00360	0.00000+-	0.16081	0.00+	-21.73	0.0
C51	SB	*	0.00010<	0.00390	0.00000<	0.16081	0.00<	*****	0.0
C56	BA	*	0.00660+-	0.00160	0.00000+-	0.16081	0.00+	-24.37	0.0
C57	LA	*	0.00080<	0.00110	0.00000<	0.16081	0.00<	*****	0.0
C80	HG	*	0.00000<	0.00080	0.00000<	0.16081	0.00<	0.00	0.0
C82	PB	*	0.01680+-	0.00160	0.00000+-	0.16081	0.00+	-9.57	-0.1
C200	TC		17.68530+-	1.03410	0.00000+-	0.16081	0.00+	-0.01	-16.9
C201	OC	*	16.28640+-	0.91420	13.58357+-	3.94966	0.83+-	0.25	-0.7
C202	EC	*	1.38880+-	0.16940	3.66042+-	2.40752	2.64+-	1.76	0.9
C203	SO4		1.97750+-	0.09870	0.08293+-	0.16089	0.04+-	0.08	-10.0
C204	NO3	*	12.23980+-	0.61200	12.60684+-	0.65132	1.03+-	0.07	0.4
C205	NH4	*	3.97590+-	0.19900	3.66005+-	0.39992	0.92+-	0.11	-0.7
C217	CL2		0.22110+-	0.01110	0.00000+-	0.16081	0.00+-	0.73	-1.4
C219	K2		0.19110+-	0.00960	0.00000+-	0.16081	0.00+-	0.84	-1.2
C300	F2		0.15990+-	0.00800	0.00000+-	0.00329	0.00+-	0.02	-18.5
C301	NA2		2.63530+-	0.13200	0.00000+-	0.00329	0.00+-	0.00	-20.0
C302	CA2		0.59120+-	0.02960	0.00000+-	0.00329	0.00+-	0.01	-19.9
C303	MG2		0.07660+-	0.00380	0.00000+-	0.00329	0.00+-	0.04	-15.2
C304	NA	*	0.00000<	0.02680	0.00000<	0.00329	0.00<	0.00	0.0
C305	CO	*	0.00000<	0.00160	0.00000<	0.00329	0.00<	0.00	0.0

---

Chemical Mass Balance Version EPA-CMB8.2  
Report Date: 8/17/2008

SAMPLE:                OPTIONS:                INPUT FILES:  
  
SITE:     HELEN        BRITT & LUECKE:     No        INHELEN2.IN8  
SAMPLE DATE: 1/31/08     SOURCE ELIMINATION:     No        SOHAMIL3.SEL  
DURATION:    24        BEST FIT:            No        POHELEN2.txt  
START HOUR:    0     DSHELEN2.SEL  
SIZE:     FINE    ADHELEN2.txt  
    PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.99	% MASS	132.9
CHI SQUARE	0.08	DEGREES FREEDOM	31

SOURCE CONTRIBUTION ESTIMATES:

SOURCE  
EST CODE    NAME    SCE( $\mu\text{g}/\text{m}^3$ )    Std Err    Tstat  
-----  
YES HAML07 RDDST\_HE    0.11912    0.04030    2.95579  
YES HAML11 S04\_FZER    0.09791    0.01607    6.09361  
YES HAML13 NH4NO3F2    0.33691    0.02697    12.49055  
YES HAML54 RWC\_F222    4.36456    0.54678    7.98226  
  
-----  
                  4.91850

MEASURED CONCENTRATION FOR SIZE: FINE

3.7+- 0.0

Eligible Space Collinearity Display

=====

ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 0.74000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
0.01567 0.02697 0.04038 0.54679  
-----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML07 1.0000 HAML11 1.0000 HAML13 1.0000 HAML54  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL

-----  
 SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU		3.70000+-	0.00010	4.91850+-	0.54564	1.33+-	0.15	2.2
C12	MG	*	0.00240<	0.00510	0.00000<	0.00979	0.00<	4.08	-0.2
C13	AL		0.01600+-	0.00390	0.01073+-	0.00985	0.67+-	0.64	-0.5
C14	SI	*	0.03330+-	0.00290	0.03352+-	0.01028	1.01+-	0.32	0.0
C15	P	*	0.00000<	0.00090	0.00067<	0.00980	0.00<	0.00	0.1
C16	S	*	0.04130+-	0.00410	0.04130+-	0.00325	1.00+-	0.13	0.0
C17	CL		0.00980+-	0.00200	0.00854+-	0.00980	0.87+-	1.02	-0.1
C19	K		0.02010+-	0.00160	0.01733+-	0.00980	0.86+-	0.49	-0.3
C20	CA		0.01480+-	0.00120	0.01250+-	0.00982	0.84+-	0.67	-0.2
C22	TI	*	0.00000<	0.00040	0.00062<	0.00980	0.00<	0.00	0.1
C23	V	*	0.00000<	0.00030	0.00005<	0.00979	0.00<	0.00	0.0
C24	CR	*	0.00000<	0.00040	0.00002<	0.00979	0.00<	0.00	0.0
C25	MN	*	0.00000<	0.00060	0.00042<	0.00979	0.00<	0.00	0.0
C26	FE		0.01770+-	0.00220	0.00512+-	0.00980	0.29+-	0.55	-1.3
C28	NI	*	0.00250+-	0.00070	0.00000+-	0.00979	0.00+-	3.92	-0.3
C29	CU	*	0.00220+-	0.00070	0.00045+-	0.00979	0.21+-	4.45	-0.2
C30	ZN	*	0.01010+-	0.00080	0.00280+-	0.00979	0.28+-	0.97	-0.7
C31	GA	*	0.00070+-	0.00040	0.00000+-	0.00979	0.00+-	13.99	-0.1
C32	GE	*	0.00000<	0.00040	0.00000<	0.00979	0.00<	0.00	0.0
C33	AS	*	0.00000<	0.00060	0.00041<	0.00979	0.00<	0.00	0.0
C34	SE	*	0.00000<	0.00030	0.00004<	0.00979	0.00<	0.00	0.0
C35	BR		0.00090+-	0.00030	0.00021+-	0.00979	0.24+-	10.88	-0.1
C37	RB	*	0.00010<	0.00030	0.00007<	0.00979	0.74<	97.93	0.0
C38	SR	*	0.00000<	0.00030	0.00021<	0.00979	0.00<	0.00	0.0
C39	Y	*	0.00040<	0.00050	0.00000<	0.00979	0.00<	24.48	0.0
C40	ZR	*	0.00080+-	0.00060	0.00022+-	0.00979	0.27+-	12.24	-0.1

C42	MO	*	0.00060<	0.00080	0.00000<	0.00979	0.00<	16.32	-0.1
C46	PD	*	0.00010<	0.00260	0.00000<	0.00979	0.00<	97.91	0.0
C47	AG	*	0.00000<	0.00280	0.00002<	0.00979	0.00<	0.00	0.0
C48	CD	*	0.00000<	0.00290	0.00027<	0.00980	0.00<	0.00	0.0
C49	IN	*	0.00000<	0.00310	0.00000<	0.00979	0.00<	0.00	0.0
C50	SN	*	0.00140<	0.00350	0.00006<	0.00979	0.04<	6.99	-0.1
C51	SB	*	0.00000<	0.00380	0.00045<	0.00980	0.00<	0.00	0.0
C56	BA		0.00260+-	0.00150	0.00125+-	0.00986	0.48+-	3.80	-0.1
C57	LA	*	0.00040<	0.00090	0.00000<	0.00979	0.00<	24.48	0.0
C80	HG	*	0.00000<	0.00070	0.00006<	0.00979	0.00<	0.00	0.0
C82	PB	*	0.00150+-	0.00090	0.00337+-	0.00980	2.25+-	6.67	0.2
C200	TC		3.66690+-	0.33320	3.67933+-	0.35396	1.00+-	0.13	0.0
C201	OC	*	3.54700+-	0.27730	3.53530+-	0.35367	1.00+-	0.13	0.0
C202	EC	*	0.12140+-	0.10590	0.14403+-	0.01742	1.19+-	1.04	0.2
C203	SO4		0.28100+-	0.01410	0.00000+-	0.00979	0.00+-	0.03	-16.4
C204	NO3	*	0.26350+-	0.01320	0.26110+-	0.01633	0.99+-	0.08	-0.1
C205	NH4	*	0.00000<	0.06240	0.07580<	0.01238	0.00<	0.00	1.2
C217	CL2		0.08740+-	0.00440	0.00000+-	0.00979	0.00+-	0.11	-8.1
C219	K2		0.00000<	0.06240	0.00000<	0.00979	0.00<	0.00	0.0
C300	F2		0.10370+-	0.00520	0.00000+-	0.00044	0.00+-	0.00	-19.9
C301	NA2		2.64360+-	0.13240	0.00000+-	0.00044	0.00+-	0.00	-20.0
C302	CA2		0.52460+-	0.02630	0.00000+-	0.00044	0.00+-	0.00	-19.9
C303	MG2		0.06660+-	0.00330	0.00000+-	0.00044	0.00+-	0.01	-20.0
C304	NA	*	0.00840<	0.02650	0.00000<	0.00044	0.00<	0.05	-0.3
C305	CO	*	0.00000<	0.00130	0.00000<	0.00044	0.00<	0.00	0.0

---

EPA-CMB8.2

Report Date: 8/17/2008

SAMPLE:	OPTIONS:	INPUT FILES:
SITE: HELEN	BRITT & LUECKE: No	INHELEN2.IN8
SAMPLE DATE: 2/6/08	SOURCE ELIMINATION: No	SOHAMIL3.SEL
DURATION: 24	BEST FIT: No	POHELEN2.txt
START HOUR: 0		DSHELEN2.SEL
SIZE: FINE		ADHELEN2.txt
		PRHAMIL3.csv

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.93	% MASS	110.1
CHI SQUARE	0.52	DEGREES FREEDOM	32

SOURCE CONTRIBUTION ESTIMATES:

SOURCE	EST CODE	NAME	SCE( $\mu\text{g}/\text{m}^3$ )	Std Err	Tstat
YES HAML11	S04_FZER		0.10013	0.01560	6.41906
YES HAML13	NH4NO3F2		0.19522	0.01897	10.28904
YES HAML64	RSWDBRN5		2.34610	0.28278	8.29658
			2.64145		

MEASURED CONCENTRATION FOR SIZE: FINE

2.4+- 0.0

Eligible Space Collinearity Display

ELIGIBLE SPACE DIM. = 3 FOR MAX. UNC. = 0.48000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

0.01558 0.01897 0.28278

NUMBER ESTIMABLE SOURCES = 3 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML64  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====  
 =====

SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	2.40000+-	0.00010	2.64145+-	0.28272	1.10+-	0.12 0.9
C12	MG *	0.00000<	0.00520	0.00000<	0.01002	0.00<	0.00 0.0
C13	AL	0.00710+-	0.00360	0.00000+-	0.01001	0.00+-	1.41 -0.7
C14	SI *	0.01640+-	0.00220	0.00107+-	0.01001	0.07+-	0.61 -1.5
C15	P *	0.00260+-	0.00100	0.00000+-	0.01001	0.00+-	3.85 -0.3
C16	S *	0.03520+-	0.00400	0.03520+-	0.00330	1.00+-	0.15 0.0
C17	CL	0.02980+-	0.00290	0.00250+-	0.01001	0.08+-	0.34 -2.6
C19	K	0.01100+-	0.00140	0.00450+-	0.01001	0.41+-	0.91 -0.6
C20	CA	0.00980+-	0.00100	0.00009+-	0.01001	0.01+-	1.02 -1.0
C22	TI *	0.00000<	0.00050	0.00000<	0.01001	0.00<	0.00 0.0
C23	V *	0.00000<	0.00030	0.00000<	0.01001	0.00<	0.00 0.0
C24	CR *	0.00050+-	0.00050	0.00000+-	0.01001	0.00+-	20.03 0.0
C25	MN *	0.00000<	0.00070	0.00000<	0.01001	0.00<	0.00 0.0
C26	FE	0.00630+-	0.00110	0.00003+-	0.01001	0.01+-	1.59 -0.6
C28	NI *	0.00050<	0.00070	0.00000<	0.01001	0.00<	20.03 0.0
C29	CU *	0.00090+-	0.00070	0.00000+-	0.01001	0.00+-	11.13 -0.1
C30	ZN *	0.00680+-	0.00080	0.00032+-	0.01001	0.05+-	1.47 -0.6
C31	GA *	0.00050+-	0.00050	0.00000+-	0.01001	0.00+-	20.03 0.0
C32	GE *	0.00010<	0.00040	0.00000<	0.01002	0.00<	***** 0.0
C33	AS *	0.00040<	0.00070	0.00000<	0.01001	0.00<	25.03 0.0
C34	SE *	0.00070+-	0.00040	0.00000+-	0.01001	0.00+-	14.30 -0.1
C35	BR	0.00080+-	0.00030	0.00002+-	0.01001	0.02+-	12.52 -0.1
C37	RB *	0.00000<	0.00040	0.00001<	0.01001	0.00<	0.00 0.0
C38	SR *	0.00000<	0.00040	0.00000<	0.01001	0.00<	0.00 0.0
C39	Y *	0.00000<	0.00050	0.00000<	0.01001	0.00<	0.00 0.0
C40	ZR *	0.00000<	0.00070	0.00000<	0.01001	0.00<	0.00 0.0

C42	MO	*	0.00000<	0.00100	0.00000<	0.01001	0.00<	0.00	0.0
C46	PD	*	0.00240<	0.00270	0.00000<	0.01001	0.00<	4.17	-0.2
C47	AG	*	0.00380+-	0.00290	0.00001+-	0.01001	0.00+-	2.64	-0.4
C48	CD	*	0.00000<	0.00310	0.00000<	0.01001	0.00<	0.00	0.0
C49	IN	*	0.00000<	0.00330	0.00002<	0.01001	0.00<	0.00	0.0
C50	SN	*	0.00190<	0.00360	0.00005<	0.01001	0.02<	5.27	-0.2
C51	SB	*	0.00000<	0.00400	0.00000<	0.01001	0.00<	0.00	0.0
C56	BA		0.00000<	0.00170	0.00013<	0.01002	0.00<	0.00	0.0
C57	LA	*	0.00000<	0.00110	0.00013<	0.01003	0.00<	0.00	0.0
C80	HG	*	0.00080+-	0.00080	0.00000+-	0.01001	0.00+-	12.52	-0.1
C82	PB	*	0.00220+-	0.00100	0.00000+-	0.01001	0.00+-	4.55	-0.2
C200	TC		2.27310+-	0.26330	2.19826+-	0.12813	0.97+-	0.13	-0.3
C201	OC	*	2.18320+-	0.20880	1.76638+-	0.12541	0.81+-	0.10	-1.7
C202	EC	*	0.08990<	0.10440	0.43188<	0.02811	4.80<	5.59	3.2
C203	SO4		0.21730+-	0.01090	0.00350+-	0.01002	0.02+-	0.05	-14.4
C204	NO3	*	0.15490+-	0.00770	0.15420+-	0.01256	1.00+-	0.09	0.0
C205	NH4	*	0.00000<	0.06240	0.04475<	0.01094	0.00<	0.00	0.7
C217	CL2		0.08740+-	0.00440	0.00002+-	0.01002	0.00+-	0.11	-8.0
C219	K2		0.00000<	0.06240	0.00391<	0.01001	0.00<	0.00	0.1
C300	F2		0.06990+-	0.00350	0.00000+-	0.00024	0.00+-	0.00	-19.9
C301	NA2		0.42880+-	0.02140	0.00000+-	0.00024	0.00+-	0.00	-20.0
C302	CA2		0.22940+-	0.01150	0.00000+-	0.00024	0.00+-	0.00	-19.9
C303	MG2		0.03030+-	0.00150	0.00000+-	0.00024	0.00+-	0.01	-20.0
C304	NA	*	0.00500<	0.02800	0.00000<	0.00024	0.00<	0.05	-0.2
C305	CO	*	0.00000<	0.00150	0.00000<	0.00002	0.00<	0.00	0.0

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Chemical Mass Balance Version EPA-CMB8.2  
 Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:

SITE:     HELEN            BRITT & LUECKE:     No     INHELEN2.IN8  
 SAMPLE DATE: 2/12/08     SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
 DURATION:   24            BEST FIT:            No     POHELEN2.txt  
 START HOUR:   0    DSHELEN2.SEL  
 SIZE:     FINE    ADHELEN2.txt  
    PRHAMIL3.csv

Species Array: 1  
 Sources Array: 1

FITTING STATISTICS:

R SQUARE    0.95                    % MASS    105.3  
 CHI SQUARE    0.45                    DEGREES FREEDOM    35

SOURCE CONTRIBUTION ESTIMATES:

SOURCE

EST CODE	NAME	SCE(µg/m³)	Std Err	Tstat
YES HAML01	ST_SANDF	0.22562	0.04922	4.58367
YES HAML11	S04_FZER	0.09672	0.01573	6.14749
YES HAML13	NH4NO3F2	0.30084	0.02722	11.05050
YES HAML20	LDV_WCAT	1.15073	0.41181	2.79429
YES HAML54	RWC_F222	2.43744	0.46103	5.28690

-----  
 4.21135

MEASURED CONCENTRATION FOR SIZE: FINE  
 4.0+- 0.0

Eligible Space Collinearity Display

=====

ELIGIBLE SPACE DIM. = 5 FOR MAX. UNC. = 0.80000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
 0.01561 0.02549 0.04917 0.27086 0.55577

-----  
 NUMBER ESTIMABLE SOURCES = 5 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE  
 -----  
 1.0000 HAML01 1.0000 HAML11 1.0000 HAML13 1.0000 HAML20 1.0000 HAML54  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====  
 =====

SPECIES CONCENTRATIONS:

SPECIES	FIT	MEASURED	CALCULATED RESIDUAL		MEASURED	UNCERTAINTY
			CALCULATED	RESIDUAL		
TMAC	TMAU	4.0000+- 0.00010	4.21135+- 0.38603	1.05+- 0.10	0.5	
C12	MG *	0.00000< 0.00540	0.00039< 0.00967	0.00< 0.00	0.0	
C13	AL *	0.01880+- 0.00410	0.02046+- 0.01008	1.09+- 0.59	0.2	
C14	SI *	0.03750+- 0.00310	0.05038+- 0.01195	1.34+- 0.34	1.0	
C15	P *	0.00130+- 0.00100	0.00214+- 0.00967	1.64+- 7.55	0.1	
C16	S *	0.03570+- 0.00410	0.03570+- 0.00319	1.00+- 0.15	0.0	
C17	CL	0.01130+- 0.00230	0.04431+- 0.00976	3.92+- 1.18	3.3	
C19	K *	0.02380+- 0.00190	0.01768+- 0.00974	0.74+- 0.41	-0.6	
C20	CA *	0.02630+- 0.00170	0.00681+- 0.00968	0.26+- 0.37	-2.0	
C22	TI *	0.00220+- 0.00050	0.00132+- 0.00967	0.60+- 4.40	-0.1	
C23	V *	0.00000< 0.00030	0.00001< 0.00967	0.00< 0.00	0.0	
C24	CR *	0.00000< 0.00050	0.00004< 0.00967	0.00< 0.00	0.0	
C25	MN *	0.00140+- 0.00060	0.00034+- 0.00967	0.24+- 6.91	-0.1	
C26	FE *	0.04000+- 0.00230	0.01334+- 0.00969	0.33+- 0.24	-2.7	
C28	NI *	0.00150+- 0.00080	0.00048+- 0.00967	0.32+- 6.45	-0.1	
C29	CU *	0.02380+- 0.00160	0.01292+- 0.00967	0.54+- 0.41	-1.1	
C30	ZN *	0.01260+- 0.00100	0.01293+- 0.00967	1.03+- 0.77	0.0	
C31	GA *	0.00000< 0.00050	0.00000< 0.00967	0.00< 0.00	0.0	
C32	GE *	0.00000< 0.00040	0.00000< 0.00967	0.00< 0.00	0.0	
C33	AS *	0.00050< 0.00080	0.00001< 0.00967	0.02< 19.34	-0.1	
C34	SE *	0.00110+- 0.00040	0.00002+- 0.00967	0.01+- 8.79	-0.1	
C35	BR	0.00090+- 0.00030	0.00051+- 0.00967	0.57+-10.75	0.0	
C37	RB *	0.00000< 0.00030	0.00008< 0.00967	0.00< 0.00	0.0	
C38	SR *	0.00040+- 0.00040	0.00012+- 0.00967	0.31+-24.18	0.0	
C39	Y *	0.00030< 0.00050	0.00000< 0.00967	0.00< 32.24	0.0	

C40	ZR	*	0.00000<	0.00060	0.00012<	0.00967	0.00<	0.00	0.0
C42	MO	*	0.00000<	0.00090	0.00000<	0.00967	0.00<	0.00	0.0
C46	PD	*	0.00000<	0.00270	0.00000<	0.00967	0.00<	0.00	0.0
C47	AG	*	0.00000<	0.00290	0.00000<	0.00967	0.00<	0.00	0.0
C48	CD	*	0.00000<	0.00310	0.00000<	0.00967	0.00<	0.00	0.0
C49	IN	*	0.00000<	0.00330	0.00000<	0.00967	0.00<	0.00	0.0
C50	SN	*	0.00050<	0.00370	0.00000<	0.00967	0.00<	19.34	0.0
C51	SB	*	0.00000<	0.00400	0.00017<	0.00967	0.00<	0.00	0.0
C56	BA	*	0.00430+-	0.00160	0.00250+-	0.00969	0.58+-	2.26	-0.2
C57	LA	*	0.00000<	0.00100	0.00000<	0.00968	0.00<	0.00	0.0
C80	HG	*	0.00010<	0.00080	0.00002<	0.00967	0.22<	96.74	0.0
C82	PB	*	0.00640+-	0.00120	0.00243+-	0.00967	0.38+-	1.51	-0.4
C200	TC		2.77570+-	0.28860	2.05607+-	0.19783	0.74+-	0.10	-2.1
C201	OC	*	2.52610+-	0.22620	2.55215+-	0.19767	1.01+-	0.12	0.1
C202	EC	*	0.24860+-	0.11230	0.34050+-	0.01258	1.37+-	0.62	0.8
C203	SO4		0.21590+-	0.01080	0.04205+-	0.00967	0.19+-	0.05	-12.0
C204	NO3	*	0.25590+-	0.01280	0.25398+-	0.01516	0.99+-	0.08	-0.1
C205	NH4	*	0.00000<	0.06240	0.06769<	0.01181	0.00<	0.00	1.1
C217	CL2		0.06740+-	0.00340	0.01127+-	0.00975	0.17+-	0.14	-5.4
C219	K2		0.00000<	0.06240	0.00099<	0.00967	0.00<	0.00	0.0
C300	F2		0.06740+-	0.00340	0.00000+-	0.00027	0.00+-	0.00	-19.8
C301	NA2		0.46590+-	0.02320	0.00000+-	0.00027	0.00+-	0.00	-20.1
C302	CA2		0.24210+-	0.01210	0.00000+-	0.00027	0.00+-	0.00	-20.0
C303	MG2		0.03120+-	0.00160	0.00000+-	0.00027	0.00+-	0.01	-19.2
C304	NA	*	0.00000<	0.02730	0.00000<	0.00027	0.00<	0.00	0.0
C305	CO	*	0.00000<	0.00150	0.00000<	0.00027	0.00<	0.00	0.0

---

Chemical Mass Balance Version EPA-CMB8.2

Report Date: 8/17/2008

```
SAMPLE:           OPTIONS:           INPUT FILES:

SITE:    HELEN    BRITT & LUECKE:    No    INHELEN2.IN8
SAMPLE DATE: 2/18/08    SOURCE ELIMINATION: No    SOHAMIL3.SEL
DURATION:   24      BEST FIT:           No    POHELEN2.txt
START HOUR: 0                               DSHELEN2.SEL
SIZE:      FINE                               ADHELEN2.txt
                                           PRHAMIL3.csv
```

Species Array: 1  
Sources Array: 1

FITTING STATISTICS:

```
    R SQUARE    0.99          % MASS    97.7
    CHI SQUARE   0.06          DEGREES FREEDOM    35
```

SOURCE CONTRIBUTION ESTIMATES:

```
SOURCE
EST CODE  NAME    SCE( $\mu\text{g}/\text{m}^3$ )  Std Err  Tstat
-----
YES HAML01 ST_SANDF  0.45157  0.14141  3.19329
YES HAML11 S04_FZER  0.31323  0.03869  8.09521
YES HAML13 NH4NO3F2  1.15731  0.08333  13.88864
YES HAML20 LDV_WCAT  1.23901  0.60117  2.06098
YES HAML54 RWC_F222  5.44008  0.83983  6.47756
```

-----  
8.60120

MEASURED CONCENTRATION FOR SIZE: FINE

8.8+- 0.0

Eligible Space Collinearity Display

```
=====
=====
ELIGIBLE SPACE DIM. = 5 FOR MAX. UNC. = 1.76000 (20.% OF TOTAL MEAS.
MASS)
```

1 / Singular Value

-----  
0.03853 0.08252 0.14136 0.44038 0.93432

-----  
NUMBER ESTIMABLE SOURCES = 5 FOR MIN. PROJ. = 0.95  
PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE  
-----  
1.0000 HAML01 1.0000 HAML11 1.0000 HAML13 1.0000 HAML20 1.0000 HAML54  
-----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
Err  
-----  
=====

SPECIES CONCENTRATIONS:

SPECIES	FIT	MEASURED	CALCULATED RESIDUAL		MEASURED	UNCERTAINTY
			-----	-----		
TMAC	TMAU	8.80000+- 0.00010	8.60120+-	0.70595	0.98+- 0.08	-0.3
C12	MG *	0.00540< 0.00600	0.00077<	0.03132	0.14< 5.80	-0.1
C13	AL *	0.02960+- 0.00490	0.04023+-	0.03184	1.36+- 1.10	0.3
C14	SI *	0.09430+- 0.00600	0.10068+-	0.03433	1.07+- 0.37	0.2
C15	P *	0.00390+- 0.00130	0.00251+-	0.03133	0.64+- 8.04	0.0
C16	S *	0.11210+- 0.00760	0.11210+-	0.01034	1.00+- 0.11	0.0
C17	CL	0.01360+- 0.00260	0.06365+-	0.03143	4.68+- 2.48	1.6
C19	K *	0.05470+- 0.00340	0.03738+-	0.03141	0.68+- 0.58	-0.5
C20	CA *	0.03050+- 0.00200	0.01433+-	0.03134	0.47+- 1.03	-0.5
C22	TI *	0.00390+- 0.00060	0.00255+-	0.03133	0.65+- 8.03	0.0
C23	V *	0.00000< 0.00040	0.00003<	0.03132	0.00< 0.00	0.0
C24	CR *	0.00000< 0.00050	0.00009<	0.03132	0.00< 0.00	0.0
C25	MN *	0.00040< 0.00070	0.00072<	0.03132	1.79< 78.37	0.0
C26	FE *	0.04570+- 0.00260	0.02516+-	0.03135	0.55+- 0.69	-0.7
C28	NI *	0.00320+- 0.00080	0.00054+-	0.03132	0.17+- 9.79	-0.1
C29	CU *	0.00910+- 0.00090	0.01394+-	0.03132	1.53+- 3.45	0.2
C30	ZN *	0.02670+- 0.00160	0.01476+-	0.03132	0.55+- 1.17	-0.4
C31	GA *	0.00080+- 0.00050	0.00000+-	0.03132	0.00+-39.15	0.0
C32	GE *	0.00050+- 0.00040	0.00000+-	0.03132	0.00+-62.65	0.0
C33	AS *	0.00050< 0.00080	0.00002<	0.03132	0.03< 62.65	0.0
C34	SE *	0.00020< 0.00040	0.00003<	0.03132	0.17< *****	0.0
C35	BR	0.00220+- 0.00030	0.00061+-	0.03132	0.28+-14.24	-0.1
C37	RB *	0.00000< 0.00040	0.00017<	0.03132	0.00< 0.00	0.0
C38	SR *	0.00020< 0.00040	0.00027<	0.03132	1.35< *****	0.0
C39	Y *	0.00000< 0.00050	0.00000<	0.03132	0.00< 0.00	0.0

C40	ZR	*	0.00000<	0.00070	0.00028<	0.03132	0.00<	0.00	0.0
C42	MO	*	0.00070<	0.00100	0.00000<	0.03132	0.00<	44.75	0.0
C46	PD	*	0.00000<	0.00280	0.00000<	0.03132	0.00<	0.00	0.0
C47	AG	*	0.00060<	0.00290	0.00000<	0.03132	0.00<	52.21	0.0
C48	CD	*	0.00340+-	0.00310	0.00000+-	0.03133	0.00+-	9.21	-0.1
C49	IN	*	0.00120<	0.00330	0.00000<	0.03132	0.00<	26.10	0.0
C50	SN	*	0.00000<	0.00370	0.00000<	0.03132	0.00<	0.00	0.0
C51	SB	*	0.00000<	0.00400	0.00038<	0.03133	0.00<	0.00	0.0
C56	BA	*	0.00220+-	0.00170	0.00387+-	0.03136	1.76+-	14.32	0.1
C57	LA	*	0.00000<	0.00110	0.00000<	0.03133	0.00<	0.00	0.0
C80	HG	*	0.00010<	0.00080	0.00005<	0.03132	0.49<	*****	0.0
C82	PB	*	0.00470+-	0.00120	0.00289+-	0.03132	0.62+-	6.67	-0.1
C200	TC		5.44320+-	0.42280	4.58860+-	0.44212	0.84+-	0.10	-1.4
C201	OC	*	4.99380+-	0.35010	5.02982+-	0.44176	1.01+-	0.11	0.1
C202	EC	*	0.46280+-	0.12280	0.45954+-	0.03611	0.99+-	0.27	0.0
C203	SO4		0.49110+-	0.02460	0.04597+-	0.03132	0.09+-	0.06	-11.2
C204	NO3	*	0.89470+-	0.04490	0.91934+-	0.05475	1.03+-	0.08	0.3
C205	NH4	*	0.29210+-	0.01460	0.26039+-	0.04074	0.89+-	0.15	-0.7
C217	CL2		0.07240+-	0.00360	0.02255+-	0.03142	0.31+-	0.43	-1.6
C219	K2		0.00000<	0.06240	0.00198<	0.03132	0.00<	0.00	0.0
C300	F2		0.07740+-	0.00390	0.00000+-	0.00057	0.00+-	0.01	-19.6
C301	NA2		0.40200+-	0.02010	0.00000+-	0.00057	0.00+-	0.00	-20.0
C302	CA2		0.24300+-	0.01220	0.00000+-	0.00057	0.00+-	0.00	-19.9
C303	MG2		0.02820+-	0.00140	0.00000+-	0.00057	0.00+-	0.02	-18.6
C304	NA	*	0.00000<	0.01390	0.00000<	0.00057	0.00<	0.00	0.0
C305	CO	*	0.00000<	0.00160	0.00000<	0.00057	0.00<	0.00	0.0

---

Chemical Mass Balance Version EPA-CMB8.2  
 Report Date: 8/17/2008

SAMPLE:	OPTIONS:	INPUT FILES:
SITE: HELEN	BRITT & LUECKE: No	INHELEN2.IN8
SAMPLE DATE: 2/24/08	SOURCE ELIMINATION: No	SOHAMIL3.SEL
DURATION: 24	BEST FIT: No	POHELEN2.txt
START HOUR: 0		DSHELEN2.SEL
SIZE: FINE		ADHELEN2.txt
		PRHAMIL3.csv

Species Array: 1  
 Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.98	% MASS	101.9
CHI SQUARE	0.13	DEGREES FREEDOM	37

SOURCE CONTRIBUTION ESTIMATES:

SOURCE	EST CODE	NAME	SCE(μg/m <sup>3</sup> )	Std Err	Tstat
-----					
YES	HAML11	S04_FZER	1.09326	0.12535	8.72180
YES	HAML13	NH4NO3F2	3.42190	0.25256	13.54863
YES	HAML66	RSWDBRN7	4.14424	0.92403	4.48496

-----  
 8.65940

MEASURED CONCENTRATION FOR SIZE: FINE

8.5+- 0.0

Eligible Space Collinearity Display

=====

ELIGIBLE SPACE DIM. = 3 FOR MAX. UNC. = 1.70000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
 0.12525 0.25256 0.92405  
 -----

NUMBER ESTIMABLE SOURCES = 3 FOR MIN. PROJ. = 0.95  
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML11 1.0000 HAML13 1.0000 HAML66  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES  
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err  
 -----  
 =====

SPECIES CONCENTRATIONS:

		CALCULATED		RESIDUAL			
SPECIES	FIT	MEASURED	CALCULATED	MEASURED	UNCERTAINTY		
-----							
TMAC	TMAU	8.50000+- 0.00010	8.65940+- 0.95981	1.02+- 0.11	0.2		
C12	MG *	0.01030+- 0.00590	0.00008+- 0.10933	0.01+-10.61	-0.1		
C13	AL *	0.01510+- 0.00410	0.00051+- 0.10933	0.03+- 7.24	-0.1		
C14	SI *	0.03160+- 0.00300	0.00102+- 0.10933	0.03+- 3.46	-0.3		
C15	P *	0.00120< 0.00140	0.00005< 0.10933	0.04< 91.11	0.0		
C16	S *	0.37150+- 0.02020	0.37150+- 0.03649	1.00+- 0.11	0.0		
C17	CL	0.00840+- 0.00240	0.00532+- 0.10939	0.63+-13.02	0.0		
C19	K *	0.02480+- 0.00190	0.03871+- 0.11893	1.56+- 4.80	0.1		
C20	CA *	0.01330+- 0.00120	0.00128+- 0.10933	0.10+- 8.22	-0.1		
C22	TI *	0.00130+- 0.00050	0.00000+- 0.10933	0.00+-84.10	0.0		
C23	V *	0.00080+- 0.00030	0.00000+- 0.10933	0.00+-*****	0.0		
C24	CR *	0.00000< 0.00050	0.00000< 0.10933	0.00< 0.00	0.0		
C25	MN *	0.00030< 0.00070	0.00007< 0.10933	0.23< *****	0.0		
C26	FE *	0.02320+- 0.00260	0.00069+- 0.10933	0.03+- 4.71	-0.2		
C28	NI *	0.00210+- 0.00070	0.00000+- 0.10933	0.00+-52.06	0.0		
C29	CU *	0.00360+- 0.00080	0.00002+- 0.10933	0.00+-30.37	0.0		
C30	ZN *	0.00920+- 0.00080	0.00125+- 0.10933	0.14+-11.88	-0.1		
C31	GA *	0.00020< 0.00050	0.00000< 0.10933	0.00< *****	0.0		
C32	GE *	0.00040+- 0.00040	0.00000+- 0.10933	0.00+-*****	0.0		
C33	AS *	0.00060< 0.00070	0.00000< 0.10933	0.00< *****	0.0		
C34	SE *	0.00040+- 0.00040	0.00000+- 0.10933	0.00+-*****	0.0		
C35	BR	0.00130+- 0.00030	0.00003+- 0.10933	0.02+-84.10	0.0		
C37	RB *	0.00010< 0.00040	0.00002< 0.10933	0.25< *****	0.0		
C38	SR *	0.00020< 0.00040	0.00001< 0.10933	0.04< *****	0.0		
C39	Y *	0.00000< 0.00050	0.00000< 0.10933	0.00< 0.00	0.0		
C40	ZR *	0.00000< 0.00060	0.00000< 0.10933	0.00< 0.00	0.0		
C42	MO *	0.00000< 0.00090	0.00000< 0.10933	0.00< 0.00	0.0		



C46	PD	*	0.00000<	0.00270	0.00001<	0.10933	0.00<	0.00	0.0
C47	AG	*	0.00000<	0.00280	0.00003<	0.10933	0.00<	0.00	0.0
C48	CD	*	0.00340+-	0.00310	0.00002+-	0.10933	0.01+-	32.15	0.0
C49	IN	*	0.00000<	0.00330	0.00000<	0.10933	0.00<	0.00	0.0
C50	SN	*	0.00240<	0.00370	0.00005<	0.10933	0.02<	45.55	0.0
C51	SB	*	0.00440+-	0.00400	0.00000+-	0.10933	0.00+-	24.85	0.0
C56	BA	*	0.00130<	0.00160	0.00026<	0.10933	0.20<	84.10	0.0
C57	LA	*	0.00120+-	0.00100	0.00097+-	0.10933	0.81+-	91.11	0.0
C80	HG	*	0.00070<	0.00080	0.00000<	0.10933	0.00<	*****	0.0
C82	PB	*	0.00270+-	0.00110	0.00000+-	0.10933	0.00+-	40.49	0.0
C200	TC		2.75770+-	0.28780	2.64239+-	0.52745	0.96+-	0.22	-0.2
C201	OC	*	2.57790+-	0.22880	2.12894+-	0.49792	0.83+-	0.21	-0.8
C202	EC	*	0.17690+-	0.10890	0.51345+-	0.20550	2.90+-	2.13	1.4
C203	SO4		1.18650+-	0.05910	0.03787+-	0.11046	0.03+-	0.09	-9.2
C204	NO3	*	2.53540+-	0.12660	2.65502+-	0.17199	1.05+-	0.09	0.6
C205	NH4	*	0.95750+-	0.04790	0.77519+-	0.13374	0.81+-	0.15	-1.3
C217	CL2		0.06240+-	0.00310	0.01068+-	0.10943	0.17+-	1.75	-0.5
C219	K2		0.00000<	0.06240	0.05790<	0.11939	0.00<	0.00	0.4
C300	F2		0.06740+-	0.00340	0.00000+-	0.00055	0.00+-	0.01	-19.6
C301	NA2		0.37720+-	0.01890	0.00000+-	0.00055	0.00+-	0.00	-19.9
C302	CA2		0.24690+-	0.01240	0.00000+-	0.00055	0.00+-	0.00	-19.9
C303	MG2		0.02720+-	0.00140	0.00000+-	0.00055	0.00+-	0.02	-18.1
C304	NA	*	0.00530<	0.02950	0.00022<	0.00053	0.04<	0.26	-0.2
C305	CO	*	0.00000<	0.00150	0.00000<	0.00055	0.00<	0.00	0.0

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Chemical Mass Balance Version EPA-CMB8.2  
 Report Date: 8/17/2008

SAMPLE:                    OPTIONS:                    INPUT FILES:

SITE:     HELEN           BRITT & LUECKE:     No     INHELEN2.IN8  
 SAMPLE DATE: 3/1/08     SOURCE ELIMINATION:   No     SOHAMIL3.SEL  
 DURATION:   24           BEST FIT:            No     POHELEN2.txt  
 START HOUR:  0                                 DSHELEN2.SEL  
 SIZE:     FINE                                 ADHELEN2.txt  
    PRHAMIL3.csv

Species Array: 1  
 Sources Array: 1

FITTING STATISTICS:

R SQUARE	0.98	% MASS	98.9
CHI SQUARE	0.15	DEGREES FREEDOM	36

SOURCE CONTRIBUTION ESTIMATES:

SOURCE	EST CODE	NAME	SCE( $\mu\text{g}/\text{m}^3$ )	Std Err	Tstat
-----	YES HAML05	RDDST_BT	0.29039	0.07059	4.11372
	YES HAML11	S04_FZER	0.24417	0.03081	7.92603
	YES HAML13	NH4NO3F2	0.35911	0.03804	9.43952
	YES HAML63	RSWDBRN4	1.67739	0.25810	6.49903

-----  
 2.57106

MEASURED CONCENTRATION FOR SIZE: FINE

2.6+- 0.0

Eligible Space Collinearity Display

=====

ELIGIBLE SPACE DIM. = 4 FOR MAX. UNC. = 0.52000 (20.% OF TOTAL MEAS. MASS)

1 / Singular Value

-----  
 0.03071 0.03804 0.07063 0.25810  
 -----

NUMBER ESTIMABLE SOURCES = 4 FOR MIN. PROJ. = 0.95

PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

-----  
 1.0000 HAML05 1.0000 HAML11 1.0000 HAML13 1.0000 HAML63  
 -----

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE Std  
 Err

-----  
 =====  
 =====  
 SPECIES CONCENTRATIONS:

CALCULATED RESIDUAL

-----  
 SPECIES FIT MEASURED CALCULATED MEASURED UNCERTAINTY  
 -----

TMAC	TMAU	2.60000+-	0.00010	2.57106+-	0.27065	0.99+-	0.10	-0.1
C12	MG *	0.00530<	0.00570	0.00000<	0.02442	0.00<	4.61	-0.2
C13	AL *	0.03360+-	0.00490	0.03924+-	0.02473	1.17+-	0.76	0.2
C14	SI *	0.09540+-	0.00590	0.10143+-	0.02644	1.06+-	0.28	0.2
C15	P *	0.00100<	0.00110	0.00119<	0.02442	1.19<	24.45	0.0
C16	S *	0.08530+-	0.00630	0.08530+-	0.00806	1.00+-	0.12	0.0
C17	CL	0.00100<	0.00210	0.00270<	0.02442	2.70<	25.07	0.1
C19	K *	0.01980+-	0.00170	0.00863+-	0.02443	0.44+-	1.23	-0.5
C20	CA *	0.03930+-	0.00240	0.01167+-	0.02444	0.30+-	0.62	-1.1
C22	TI *	0.00280+-	0.00050	0.00099+-	0.02442	0.35+-	8.72	-0.1
C23	V *	0.00000<	0.00030	0.00009<	0.02442	0.00<	0.00	0.0
C24	CR *	0.00060+-	0.00050	0.00009+-	0.02442	0.15+-	40.70	0.0
C25	MN *	0.00090+-	0.00060	0.00038+-	0.02442	0.42+-	27.13	0.0
C26	FE *	0.03690+-	0.00220	0.01266+-	0.02445	0.34+-	0.66	-1.0
C28	NI *	0.00360+-	0.00080	0.00003+-	0.02442	0.01+-	6.78	-0.1
C29	CU *	0.00270+-	0.00070	0.00096+-	0.02442	0.35+-	9.04	-0.1
C30	ZN *	0.00780+-	0.00080	0.00090+-	0.02442	0.12+-	3.13	-0.3
C31	GA *	0.00030<	0.00050	0.00000<	0.02442	0.00<	81.39	0.0
C32	GE *	0.00030<	0.00040	0.00000<	0.02442	0.00<	81.39	0.0
C33	AS *	0.00020<	0.00070	0.00006<	0.02442	0.31<	*****	0.0
C34	SE *	0.00010<	0.00030	0.00000<	0.02442	0.02<	*****	0.0
C35	BR	0.00090+-	0.00030	0.00002+-	0.02442	0.02+-	27.13	0.0
C37	RB *	0.00070+-	0.00030	0.00000+-	0.02442	0.00+-	34.88	0.0
C38	SR *	0.00010<	0.00040	0.00009<	0.02442	0.89<	*****	0.0
C39	Y *	0.00000<	0.00050	0.00000<	0.02442	0.00<	0.00	0.0
C40	ZR *	0.00050<	0.00060	0.00000<	0.02442	0.00<	48.83	0.0

C42	MO	*	0.00000<	0.00090	0.00000<	0.02442	0.00<	0.00	0.0
C46	PD	*	0.00000<	0.00280	0.00006<	0.02442	0.00<	0.00	0.0
C47	AG	*	0.00170<	0.00290	0.00001<	0.02442	0.00<	14.36	-0.1
C48	CD	*	0.00250<	0.00310	0.00002<	0.02442	0.01<	9.77	-0.1
C49	IN	*	0.00000<	0.00330	0.00000<	0.02442	0.00<	0.00	0.0
C50	SN	*	0.00000<	0.00360	0.00000<	0.02442	0.00<	0.00	0.0
C51	SB	*	0.00220<	0.00400	0.00028<	0.02442	0.13<	11.10	-0.1
C56	BA	*	0.00140<	0.00160	0.00013<	0.02442	0.09<	17.44	-0.1
C57	LA	*	0.00000<	0.00110	0.00013<	0.02442	0.00<	0.00	0.0
C80	HG	*	0.00040<	0.00080	0.00000<	0.02442	0.00<	61.04	0.0
C82	PB	*	0.00360+-	0.00110	0.00052+-	0.02442	0.15+-	6.78	-0.1
C200	TC		1.31340+-	0.21570	1.36673+-	0.09082	1.04+-	0.18	0.2
C201	OC	*	1.19850+-	0.15980	1.10728+-	0.08947	0.92+-	0.14	-0.5
C202	EC	*	0.11490+-	0.10590	0.25945+-	0.02899	2.26+-	2.10	1.3
C203	SO4		0.40320+-	0.02010	0.00236+-	0.02442	0.01+-	0.06	-12.7
C204	NO3	*	0.26970+-	0.01350	0.27890+-	0.02811	1.03+-	0.12	0.3
C205	NH4	*	0.10490+-	0.00520	0.08247+-	0.02572	0.79+-	0.25	-0.9
C217	CL2		0.00000<	0.06240	0.00002<	0.02442	0.00<	0.00	0.0
C219	K2		0.00000<	0.06240	0.00130<	0.02442	0.00<	0.00	0.0
C300	F2		0.06490+-	0.00320	0.00000+-	0.00018	0.00+-	0.00	-20.3
C301	NA2		0.40070+-	0.02010	0.00000+-	0.00018	0.00+-	0.00	-19.9
C302	CA2		0.30630+-	0.01530	0.00000+-	0.00018	0.00+-	0.00	-20.0
C303	MG2		0.04200+-	0.00210	0.00000+-	0.00018	0.00+-	0.00	-19.9
C304	NA	*	0.00000<	0.02730	0.00000<	0.00018	0.00<	0.00	0.0
C305	CO	*	0.00000<	0.00150	0.00000<	0.00005	0.00<	0.00	0.0

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