Texas Commission On Environmental Quality

To: Dois Webb, P.E.   Date: April 13, 2007
               Mechanical/Agricultural/Construction
               Section

Thru: Robert Opiela, Team Leader
               Air Dispersion Modeling Team (ADMT)

From: Dan Jamieson
               ADMT

Subject: Modeling Audit - ASARCO, LLC (RN100219021)

1.0   Project Identification Information.

       Permit Application Number: 20345
       NSR Project Number: 87998
       ADMT Project Number: 2435
       NSRP Document Number: 342571
       County: El Paso

       Modeling Report: Submitted by Zephyr Environmental Corporation, September 2006, on behalf
       of ASARCO, LLC. A revised modeling analysis was submitted November 2006 to address
       deficiencies noted by the ADMT.

2.0   Report Summary. Based on the representations made in the permit application regarding the
       condition and effectiveness of existing emission control equipment, reviewed by the permit
       reviewer, current modeling performed in accordance with applicable federal and state law, and
       Toxicology's review of the modeling results, ASARCO has demonstrated air emissions from the
       facility would not adversely affect human health and welfare.

       The purpose of this air quality analysis is for ASARCO to quantify the potential contribution to
       existing air quality concentrations in Texas, New Mexico, and Mexico from its authorized
       emissions and to demonstrate that these concentrations would not cause or contribute to a
       condition of air pollution. The air quality analysis was to be performed in accordance with the
       ASARCO Air Quality Analysis Protocol drafted by the TCEQ. Below is a summary of the
       protocol:

       - Perform air dispersion modeling for all primary and secondary sources of air contaminants at
         the site for all averaging periods. Contaminants include PM_{10}, $PM_{2.5}$, SO_2, Pb, NO_2, CO, state
         regulated pollutants listed in Chapter 112 of 30 Texas Administrative Code, and pollutants
         with an Effects Screening Level (ESL).
       - Obtain available ambient monitoring data in Texas, New Mexico, and Mexico from
         monitoring sites located within 50 kilometers (about 31 miles) of the site for contaminants
         ASARCO would be authorized to emit to be used as representative background
         concentrations of air quality.

- Provide a plot plan that shows a representation of locations for emission sources and buildings.
- Provide an area map that shows a representation of the current property line, topography, and locations of known schools and ambient air monitors located within 50 kilometers of the site.
- Provide a table listing the correlation between modeled source identifications and emission point numbers (EPNs).
- Provide a description of source characterizations used in the analysis and an explanation as to why those characterizations are appropriate.
- Provide calculations and supporting information used to derive or determine all modeling input values and parameters.
- Provide documentation for the choice of albedo, Bowen Ratio, and surface roughness length since AERMOD was used.
- Provide a table listing all downwash structures and associated building/tier heights.
- Include terrain for all sources, buildings, and receptors.
- Develop a receptor grid that extends 50 kilometers from the site. All identified schools and ambient air monitors within 50 kilometers of the site should also be included as discrete receptors.
- Use all available on-site meteorological data. Also, provide documentation on how these data were formatted for use in AERMOD.
- Provide results in maps and tables for each modeled contaminant and for each applicable averaging period. This includes the overall maximum predicted concentration anywhere off-property and predicted maximum concentrations at the location of each identified school and ambient air monitor located within 50 kilometers of the site.
- If results of the analysis show that a standard or ESL could be exceeded when the maximum predicted concentration is added to a monitored background concentration, ASARCO should discuss whether the prediction is representative.

The modeling performed in support of the permit application sufficiently follows the ASARCO Air Quality Modeling Analysis Protocol with the following exceptions: the short-term maximum predicted concentrations for the state National Ambient Air Quality Standards (NAAQS) analyses were not reported in the modeling report (the seventh highest predicted concentrations were reported for $PM_{2.5}$ and the second highest predicted concentrations were reported for CO, PM_{10}, and SO_2). Since the applicant did not model with more than one year of meteorological data, the applicant should have reported the maximum predicted concentration. However, the maximum predicted concentrations were included in the modeling files submitted and are reported in the tables below.

The maximum ground-level concentrations (GLCmax) for pollutants with ESLs were not directly added to available ambient monitoring data. For the modeling results at the location of ambient air monitors, the applicant did compare ambient monitoring data with short-term and long-term ESLs. When comparing the short-term ambient monitoring data (collected as 24-hr samples) to the short-term ESLs (1-hr values), the applicant converted the 24-hr ambient monitoring data to a

1-hr value using a factor of 2.5. This conversion technique should not be used as the converted 1-hr ambient monitoring data may be under represented. Instead, a comparison of 24-hr model predictions with 24-hr ambient monitoring data is more appropriate. The ADMT used a screening conversion factor of 0.6 to convert 1-hr model predictions to 24-hr model predictions. These values were then added to available ambient monitoring data and compared to a 24-hr ESL provided by Toxicology.

With the exception of 1-hr iron oxide fume, 1-hr SO_2, 3-hr SO_2, and annual SO_2, the GLCmax for all pollutants and averaging periods are located within 100 meters (about 328 feet) of the property line. The GLCmax for 1-hr iron oxide fume and 1-hr SO_2 are located approximately three kilometers (less than about two miles) from the property line. The GLCmax for 3-hr and annual SO_2 are located approximately six (less than about four miles) and one kilometer (less than about 3/4 miles), respectively, from the property line. The applicant did not address a specific ground-level concentration for the nearest non-industrial receptor (GLCni). However, discrete receptors were modeled at schools and ambient air monitoring sites located within 50 kilometers of the site. For the tables in the appendix of this memo, the maximum predicted concentrations from all of the schools and ambient air monitoring sites are provided as School GLCmax and Monitor GLCmax, respectively.

The applicant provided available ambient air monitoring data for SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO, Pb, arsenic, cadmium, chromium, manganese, nickel, and mercury from monitoring sites in Texas, New Mexico, and Mexico that were within 50 kilometers of the site for the years 2003 to the first part of 2006. The ADMT reviewed the Texas Air Monitoring Information System (TAMIS) database for monitoring data of contaminants that the applicant would be authorized to emit and found that monitoring data from the following monitoring sites were not provided by the applicant:

EPA AIRS monitor 481410002 - arsenic, cadmium, and zinc.
EPA AIRS monitor 481410033 - arsenic, cadmium, and zinc.
EPA AIRS monitor 481410041 - copper (PM_{10}), iron (PM_{10}), and zinc (PM_{10}).
EPA AIRS monitor 481410044 - antimony ($PM_{2.5}$), barium ($PM_{2.5}$), calcium ($PM_{2.5}$), cobalt ($PM_{2.5}$), copper ($PM_{2.5}$), iron ($PM_{2.5}$), selenium ($PM_{2.5}$), silver ($PM_{2.5}$), and zinc ($PM_{2.5}$).
EPA AIRS monitor 481410053 - antimony ($PM_{2.5}$), barium ($PM_{2.5}$), calcium ($PM_{2.5}$), cobalt ($PM_{2.5}$), copper ($PM_{2.5}$), iron ($PM_{2.5}$), selenium ($PM_{2.5}$), silver ($PM_{2.5}$), and zinc ($PM_{2.5}$).
EPA AIRS monitor 481410058 - arsenic, cadmium, and zinc.

The ADMT has extracted ambient monitoring data from TAMIS for the pollutants listed above and has reported the values in the tables below.

Table 1. Sitewide Modeling Results for State Property Line			
Pollutant	Averaging Time	GLCmax ($\mu g/m^3$)	Standard ($\mu g/m^3$)
SO_2	1-hr	923	1021
H_2SO_4	1-hr	6.7	50
	24-hr	0.4	15

Table 2. Sitewide Modeling Results for Health Effects					
Pollutant & CAS#	Averaging Time	GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
Alumina 1344-28-1	1-hr	1.8	Not Available (NA)	1.8	50
	Annual	0.04	NA	0.04	5
Amorphous fused silica 60676-86-0	1-hr	1.1	NA	1.1	10
	Annual	0.02	NA	0.02	1
Antimony 7440-36-0	1-hr	0.2	NA	0.2	5
	24-hr	0.12	0.054	0.174	3
	Annual	0.004	0.01	0.014	0.5
Arsenic 7440-38-2	1-hr	0.17	NA	0.17	0.1
	24-hr	0.102	0.05	0.152	0.06
	Annual	0.003	0.007	0.01	0.01
Barium 7440-39-3	1-hr	0.1	NA	0.1	5
	24-hr	0.06	0.15	0.21	3
	Annual	0.001	0.03	0.031	0.5
Bismuth 1304-82-1	1-hr	0.2	NA	0.2	50
	Annual	0.003	NA	0.003	5
Cadmium	1-hr	0.04	NA	0.04	0.1

Table 2. Sitewide Modeling Results for Health Effects					
Pollutant & CAS#	Averaging Time	GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
NA	24-hr	0.024	0.018	0.042	0.06
	Annual	0.001	0.0065	0.0075	0.01
Calcium oxide 1305-78-8	1-hr	5.3	NA	5.3	20
	24-hr	3.18	5.1	8.28	12
	Annual	0.1	1.3	1.4	2
Chromium 7440-47-3	1-hr	0.02	NA	0.02	1
	24-hr	0.012	0.067	0.079	0.6
	Annual	0.0003	0.005	0.0053	0.1
Cobalt 7440-48-4	1-hr	0.04	NA	0.04	0.2
	24-hr	0.024	0.0034	0.0274	0.12
	Annual	0.001	0.0014	0.0024	0.02
Copper dust 7440-50-8	1-hr	21.9	NA	21.9	10
	24-hr	13.14	0.13	13.27	6
	Annual	0.15	0.04	0.19	1
Copper fume 7440-50-8	1-hr	1	NA	1	1
	Annual	0.015	NA	0.015	0.1
Crystalline silica 14808-60-7	1-hr	4.1	NA	4.1	10
	Annual	0.1	NA	0.1	1
Gypsum 7778-18-9	1-hr	1.7	NA	1.7	50
	Annual	0.03	NA	0.03	5
Iron dust 1309-37-1	1-hr	34.5	NA	34.5	50
	24-hr	20.7	6.3	27	30
	Annual	0.6	1.2	1.8	5
Iron oxide fume	1-hr	9.2	NA	9.2	50

Table 2. Sitewide Modeling Results for Health Effects					
Pollutant & CAS#	Averaging Time	GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
1309-37-1	Annual	0.1	NA	0.1	5
Limestone dust	1-hr	5.3	NA	5.3	50
1317-65-3	Annual	0.08	NA	0.08	5
Manganese oxide	1-hr	3.3	NA	3.3	2
	24-hr	1.98	0.175	2.155	1.2
7439-96-5	Annual	0.02	0.014	0.034	0.2
Mercury	1-hr	0.0002	NA	0.0002	0.25
NA	24-hr	0.00012	0.018	0.01812	0.15
	Annual	0.00001	0.0025	0.00251	0.025
Nickel	1-hr	0.06	NA	0.06	0.15
7440-02-0	24-hr	0.036	0.006	0.042	0.09
	Annual	0.001	0.0007	0.0017	0.015
Selenium	1-hr	0.04	NA	0.04	2
7782-49-2	24-hr	0.024	0.002	0.026	1.2
	Annual	0.0008	0.0005	0.0013	0.2
Silver	1-hr	0.13	NA	0.13	0.1
7440-22-4	24-hr	0.078	0.014	0.092	0.06
	Annual	0.002	0.003	0.005	0.01
Tellurium	1-hr	0.09	NA	0.09	1
13494-80-9	Annual	0.001	NA	0.001	0.1
Thallium	1-hr	0.008	NA	0.008	1
7440-28-0	Annual	0.0002	NA	0.0002	0.1
Zinc oxide	1-hr	2	NA	2	50
1314-13-2	24-hr	1.2	0.19	1.39	30

Table 2. Sitewide Modeling Results for Health Effects					
Pollutant & CAS#	Averaging Time	GLCmax (µg/m³)	Background (µg/m³)	Total Conc. = [Background + GLCmax] (µg/m³)	ESL (µg/m³)
	Annual	0.03	0.04	0.07	5

The 24-hr maximum predicted concentrations are based on a screening conversion factor for 1-hr to 24-hr of 0.6.

The short-term background concentration for arsenic is based on a 24-hr averaging period and was obtained from the EPA AIRS monitor 481410033 at 301 East Robinson, El Paso, El Paso County. The short-term background concentrations for copper and iron are based on a 24-hr averaging period and were obtained from the EPA AIRS monitor 481410041 at 220 Lawton Street, El Paso, El Paso County. The short-term background concentrations for mercury, nickel, zinc, selenium, and silver are based on a 24-hr averaging period and were obtained from the EPA AIRS monitor 481410044 at 800 S. San Marcial Street, El Paso, El Paso County. The short-term background concentrations for cadmium, chromium, manganese, antimony, barium, calcium, and cobalt are based on a 24-hr averaging period and were obtained from the EPA AIRS monitor 481410053 at 700 West San Francisco Avenue, El Paso, El Paso County.

The annual background concentration for cadmium was obtained from the EPA AIRS monitor 481410002 at J Harold Tillman Hlt Ct 222 S. Campbell, El Paso, El Paso County. The annual background concentration for arsenic was obtained from the EPA AIRS monitor 481410033 at 301 East Robinson, El Paso, El Paso County. The annual background concentrations for iron and zinc were obtained from the EPA AIRS monitor 481410041 at 220 Lawton Street, El Paso, El Paso County. The annual background concentration for mercury was obtained from the EPA AIRS monitor 481410044 at 800 S. San Marcial Street, El Paso, El Paso County. The annual background concentrations for chromium, manganese, nickel, antimony, barium, calcium, cobalt, copper, selenium, and silver were obtained from the EPA AIRS monitor 481410053 at 700 West San Francisco Avenue, El Paso, El Paso County.

These monitored background concentrations are the highest monitored concentrations from all monitors within 50 kilometers of the site for the period 2003 to the first part of 2006.

Table 3. Hours of Exceedance for Health Effects			
Pollutant	Averaging Time	1X ESL GLCmax	2X ESL GLCmax
Arsenic	1-hr	7	0

Table 3. Hours of Exceedance for Health Effects			
Pollutant	Averaging Time	1X ESL GLCmax	2X ESL GLCmax
Copper dust	1-hr	13	1
Manganese oxide	1-hr	6	0
Silver	1-hr	3	0

Table 4. Modeling Results for State NAAQS AOI			
Pollutant	Averaging Time	GLCmax ($\mu g/m^3$)	De Minimis ($\mu g/m^3$)
CO	1-hr	55	2000
	8-hr	24	500

Table 5. Total Concentrations for State NAAQS (Concentrations > De Minimis)					
Pollutant	Averaging Time	GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	Standard ($\mu g/m^3$)
SO_2	3-hr	324	644	968	1300
	24-hr	93	186	279	365
	Annual	9	27	36	80
PM_{10}	24-hr	30	93	123	150
	Annual	4.6	41	45.6	50
$PM_{2.5}$	24-hr	14	21	35	35
	Annual	2.4	8.5	10.9	15
Pb	3-mo.	0.2	0.07	0.27	1.5
NO_2	Annual	8.5	38	46.5	100

The GLCmax for Pb is based on a monthly averaging period which is a conservative estimate of the quarterly average.

The annual background concentration for NO_2 was obtained from the EPA AIRS monitor 481410044 at 800 S. San Marcial Street, El Paso, El Paso County. The quarterly background concentration for Pb was obtained from the EPA AIRS monitor 481410002 at J Harold Tillman Hlt Ct 222 S. Campbell, El Paso, El Paso County. The background concentrations for SO_2 were obtained from the applicant's Rio monitor located 0.5 kilometers (about 1/3 miles) west of the site. These monitored background concentrations are the highest monitored concentrations from all monitors within 50 kilometers of the site for the period 2003 to the first part of 2006.

The 24-hour background concentrations for PM_{10} and $PM_{2.5}$ are based on data obtained from the EPA AIRS monitor 481410037 at Rim Road near Hawthorne, El Paso, El Paso County. After monitoring data had been excluded due to exceptional events associated with high winds, the applicant developed representative 24-hr background concentrations of PM_{10} and $PM_{2.5}$ based on the applicant's review of monitoring data for days with similar meteorological conditions as the meteorological conditions associated with the maximum predicted concentrations.

The annual background concentrations for PM_{10} and $PM_{2.5}$ were obtained from the EPA AIRS monitor 481410037 at Rim Road near Hawthorne, El Paso, El Paso County. The background concentrations are based on a three-year average (2003-2005) of the annual concentrations.

3.0   Land Use. Elevated terrain was used in the modeling analysis. This selection is consistent with the topographic map and Digital Elevation Models (DEMs).

Surface roughness length values were developed for twelve 30-degree sectors based on land use and topography within each sector. A single value was developed for both the Bowen ratio and albedo based on land use and vegetation within the modeling domain. These values are reasonable and representative.

4.0   Modeling Emissions Inventory. The modeled emission point and volume source parameters and rates are generally consistent with data in the modeling report. There are discrepancies with modeled source base elevations for some of the model runs, as well as discrepancies with the modeled emission rates of particulate matter.

The modeled source base elevations for many sources are not consistent with the DEM (discrepancies ranged from 14 meters below to 10 meters above) for pollutant-specific model runs of El Paso Schools, U.S. Schools - non El Paso, and the Rio, NM0017, TX0033, TX0037, TX0041, TX0053, and TX0059 ambient air monitoring sites. The ADMT compared the maximum predicted concentrations from these model runs to the predicted concentration from the nearest receptor in the "full receptor" model runs, and did not see any significant differences between the predicted concentrations.

Emission rates of PM_{10} and $PM_{2.5}$ were not modeled from the following sources: HF_11BK, HF_11MFS, HF_12BK ($PM_{2.5}$ was modeled), HF_12MFS, HF_12SI (PM_{10} was modeled), HF_17MIX, HF_18AMX, HF_18BMX, HF_19MX, HF_20MIX, and SF_11MFS. All of these·

sources are fugitive sources with no plume rise, and the maximum impacts would occur close to each source with impacts decreasing quickly with distance from the source. Given that the total emissions from these sources is relatively small (PM_{10} - 0.14 lb/hr; $PM_{2.5}$ - 0.04 lb/hr) and that the PM_{10} and $PM_{2.5}$ overall GLCmax are located away from the individual maximum impacts from the sources listed above, not including these emissions would not significantly affect the modeling results.

Annualized emission rates for SO_2 were used for the annual averaging time.

The modeled emission rates for sources HF_11BK, HF_11MFS, HF_11SI, HF_12BK, HF_12MFS, HF_12SI, UNLBDNS, UNLBDSS, UNLCUBHS, UNLPBBHS, and UNLTBHS were multiplied by hour-of-day scalars to represent operational limitations. For sources HF_11BK, HF_11MFS, HF_11SI, HF_12BK, HF_12MFS, HF_12SI, UNLCUBHS, UNLPBBHS, and UNLTBHS a scalar of 1 was modeled for hours 7 to 19. For sources UNLBDNS and UNLBDSS a scalar of 1 was modeled for hours 5 to 24.

The source characterizations used to represent the sources are appropriate.

5.0   Building Wake Effects (Downwash). Input data to the Building Profile Input Program Prime (Version 04274) are consistent with the aerial photography, plot plan, and data in the modeling report.

The source CUSTK_AN was modeled at a height 280 feet less than its actual stack height. Since this source was not influenced by building downwash, the results would be conservative.

6.0   Meteorological Data. The applicant used on-site meteorological data collected for wind speed, wind direction, and temperature from 1976. These meteorological data were supplemented with data from the El Paso International Airport.

Surface Station and ID: El Paso, TX (Station #: 23044)
Upper Air Station and ID: El Paso, TX (Station #: 23044)
Meteorological Dataset: 1976

The applicant did not correctly format the ceiling height data used in the surface station file as input to AERMET. The ceiling height data used in the surface station file were off by an order of magnitude. Given that ceiling height is currently not used in AERMET, the modeling results should not be affected by this error.

7.0   Receptor Grid. The grid modeled was extensive enough in density and spatial coverage to capture representative maximum ground-level concentrations and exceedances.

8.0   Model Used and Modeling Techniques. AERMOD (Version 04300) was used.

Appendix

The background concentrations listed in the tables below are the same background concentrations listed in tables 2 and 5 above.

Table A1. Sitewide Modeling Results for State Property Line (Schools)			
Pollutant	Averaging Time	School GLCmax ($\mu g/m^3$)	Standard ($\mu g/m^3$)
SO_2	1-hr	551	1021
H_2SO_4	1-hr	2	50
	24-hr	0.2	15

Table A2. Sitewide Modeling Results for State Property Line (Monitors)			
Pollutant	Averaging Time	Monitor GLCmax ($\mu g/m^3$)	Standard ($\mu g/m^3$)
SO_2	1-hr	196	1021

Table A3. Sitewide Modeling Results for Health Effects (Schools)					
Pollutant & CAS#	Averaging Time	School GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
Alumina 1344-28-1	1-hr	1	NA	1	50
	Annual	0.005	NA	0.005	5
Amorphous fused silica 60676-86-0	1-hr	0.1	NA	0.1	10
	Annual	0.002	NA	0.002	1
Antimony 7440-36-0	1-hr	0.06	NA	0.06	5
	24-hr	0.036	0.054	0.09	3
	Annual	0.001	0.01	0.011	0.5
Arsenic 7440-38-2	1-hr	0.045	NA	0.045	0.1
	24-hr	0.027	0.05	0.077	0.06

Table A3. Sitewide Modeling Results for Health Effects (Schools)					
Pollutant & CAS#	Averaging Time	School GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
	Annual	0.0004	0.007	0.0074	0.01
Barium 7440-39-3	1-hr	0.03	NA	0.03	5
	24-hr	0.018	0.15	0.168	3
	Annual	0.0002	0.03	0.0302	0.5
Bismuth 1304-82-1	1-hr	0.08	NA	0.08	50
	Annual	0.0004	NA	0.0004	5
Cadmium NA	1-hr	0.024	NA	0.024	0.1
	24-hr	0.0144	0.018	0.0324	0.06
	Annual	0.0002	0.0065	0.0067	0.01
Calcium oxide 1305-78-8	1-hr	1.6	NA	1.6	20
	24-hr	0.96	5.1	6.06	12
	Annual	0.015	1.3	1.315	2
Chromium 7440-47-3	1-hr	0.005	NA	0.005	1
	24-hr	0.003	0.067	0.07	0.6
	Annual	0.00002	0.005	0.00502	0.1
Cobalt 7440-48-4	1-hr	0.022	NA	0.022	0.2
	24-hr	0.0132	0.0034	0.0166	0.12
	Annual	0.0002	0.0014	0.0016	0.02
Copper dust 7440-50-8	1-hr	1.8	NA	1.8	10
	24-hr	1.08	0.13	1.21	6
	Annual	0.01	0.04	0.05	1
Copper fume 7440-50-8	1-hr	0.3	NA	0.3	1
	Annual	0.002	NA	0.002	0.1
Crystalline silica	1-hr	0.8	NA	0.8	10

Table A3. Sitewide Modeling Results for Health Effects (Schools)					
Pollutant & CAS#	Averaging Time	School GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
14808-60-7	Annual	0.007	NA	0.007	1
Gypsum 7778-18-9	1-hr	0.9	NA	0.9	50
	Annual	0.004	NA	0.004	5
Iron dust 1309-37-1	1-hr	17	NA	17	50
	24-hr	10.2	6.3	16.5	30
	Annual	0.08	1.2	1.28	5
Iron oxide fume 1309-37-1	1-hr	2	NA	2	50
	Annual	0.03	NA	0.03	5
Limestone dust 1317-65-3	1-hr	1.6	NA	1.6	50
	Annual	0.02	NA	0.02	5
Manganese oxide 7439-96-5	1-hr	0.28	NA	0.28	2
	24-hr	0.168	0.175	0.343	1.2
	Annual	0.002	0.014	0.016	0.2
Mercury NA	1-hr	0.0001	NA	0.0001	0.25
	24-hr	0.00006	0.018	0.01806	0.15
	Annual	0	0.0025	0.0025	0.025
Nickel 7440-02-0	1-hr	0.033	NA	0.033	0.15
	24-hr	0.0198	0.006	0.0258	0.09
	Annual	0.0002	0.0007	0.0009	0.015
Selenium 7782-49-2	1-hr	0.02	NA	0.02	2
	24-hr	0.012	0.002	0.014	1.2
	Annual	0.0001	0.0005	0.0006	0.2
Silver 7440-22-4	1-hr	0.03	NA	0.03	0.1
	24-hr	0.018	0.014	0.032	0.06

Table A3. Sitewide Modeling Results for Health Effects (Schools)					
Pollutant & CAS#	Averaging Time	School GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
	Annual	0.0002	0.003	0.00032	0.01
Tellurium 13494-80-9	1-hr	0.035	NA	0.035	1
	Annual	0.0001	NA	0.0001	0.1
Thallium 7440-28-0	1-hr	0.004	NA	0.004	1
	Annual	0.00002	NA	0.00002	0.1
Zinc oxide 1314-13-2	1-hr	0.4	NA	0.4	50
	24-hr	0.24	0.19	0.43	30
	Annual	0.006	0.04	0.046	5

Table A4. Sitewide Modeling Results for Health Effects (Monitors)					
Pollutant & CAS#	Averaging Time	Monitor GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
Arsenic 7440-38-2	1-hr	0.02	NA	0.02	0.1
	24-hr	0.012	0.05	0.062	0.06
	Annual	0.0002	0.007	0.0072	0.01
Cadmium NA	1-hr	0.01	NA	0.01	0.1
	24-hr	0.006	0.018	0.024	0.06
	Annual	0.0001	0.0065	0.0066	0.01
Chromium 7440-47-3	1-hr	0.001	NA	0.001	1
	24-hr	0.0006	0.067	0.0676	0.6
	Annual	0	0.005	0.005	0.1
Manganese oxide 7439-96-5	1-hr	0.04	NA	0.04	2
	24-hr	0.024	0.175	0.199	1.2

Table A4. Sitewide Modeling Results for Health Effects (Monitors)					
Pollutant & CAS#	Averaging Time	Monitor GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	ESL ($\mu g/m^3$)
Mercury NA	Annual	0.0003	0.014	0.0143	0.2
	1-hr	0.00004	NA	0.00004	0.25
	24-hr	0.000024	0.018	0.018024	0.15
	Annual	0	0.0025	0.0025	0.025
Nickel 7440-02-0	1-hr	0.01	NA	0.01	0.15
	24-hr	0.006	0.006	0.012	0.09
	Annual	0.00005	0.0007	0.00075	0.015

Table A5. Modeling Results for State NAAQS AOI (Schools)			
Pollutant	Averaging Time	School ($\mu g/m^3$)	De Minimis ($\mu g/m^3$)
CO	1-hr	28	2000
	8-hr	4	500

Table A6. Modeling Results for State NAAQS AOI (Monitors)			
Pollutant	Averaging Time	Monitor ($\mu g/m^3$)	De Minimis ($\mu g/m^3$)
CO	1-hr	7	2000
	8-hr	2	500

Table A7. Total Concentrations for State NAAQS (Schools)					
Pollutant	Averaging Time	School GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	Standard ($\mu g/m^3$)
SO_2	3-hr	187	644	831	1300

Table A7. Total Concentrations for State NAAQS (Schools)					
Pollutant	Averaging Time	School GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	Standard ($\mu g/m^3$)
	24-hr	44	186	230	365
	Annual	4	27	31	80
PM_{10}	24-hr	10	93	103	150
	Annual	0.6	41	41.6	50
$PM_{2.5}$	24-hr	6	21	27	35
	Annual	0.4	8.5	8.9	15
Pb	3-mo.	0.04	0.07	0.11	1.5
NO_2	Annual	0.7	38	38.7	100

Table 5. Total Concentrations for State NAAQS (Monitors)					
Pollutant	Averaging Time	Monitor GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)	Standard ($\mu g/m^3$)
	3-hr	134	644	778	1300
SO_2	24-hr	64	186	250	365
	Annual	8	27	35	80
PM_{10}	24-hr	2	93	95	150
	Annual	0.2	41	41.2	50
$PM_{2.5}$	24-hr	1.4	21	22.4	35
	Annual	0.1	8.5	8.6	15
Pb	3-mo.	0.004	0.07	0.074	1.5
NO_2	Annual	0.1	38	38.1	100