Page Change History
MBFP PSD Permit Application Dated December 31, 2007

Page Numbers	Revision Date	Action	Description
	2/12/08	Superseded	Updated Table of Contents, Acronyms
(1-1) 1-2	2/12/08	Superseded	Updated emissions in Table 1.1
1-7 (1-8)	2/12/08	Superseded	Updated emissions in Table 1.2
2-9 (2-10)	2/12/08	Superseded	Added sentence (bottom of page) about heating CO2 vent stream
3-3 to 3-10	2/12/08	Superseded	Revised emissions and emission-related descriptions to address operating hour and fuel simplifications requested by WDEQ *
4-7 (4-8)	1/18/08	Superseded	Revised $/ton NOx removed based on revised emissions. (Last two sentences of 1st paragraph)
5-3 to 5-10	2/12/08	Superseded	Added discussions of: • --New 40 CFR Part 60, Subpart JJJJ regulations • --Wyoming Chapter 6, Section 5 permitting requirements Revised discussion of Subpart DDDDD NESHAP
6-1 to 6-48	2/12/08	Superseded	Revised chapter to reflect new AERMOD near field modeling results and incorporated relevant portions from Appendix J
6-19 to 6-30	3/3/08	Superseded	Revised near-field modeling criteria pollutant results based on revised modeling for years 2000 and 2003
6-33 to 6-36	3/3/08	Superseded	Revised near-field modeling HAP results based on revised modeling for years 2000 and 2003
7-1 (7-2)	1/18/08	Superseded	Removed first and last sentence of first paragraph after Note. Text removed was: *MBFP is proposing to construct a 13,000 barrel per day (BPD) Industrial Gasification & Liquefaction Plant near Medicine Bow, Wyoming.* *The proposed project is scheduled to start construction in the spring of 2008 with the construction being complete by December 2010.*
Appendix B	2/12/08	Superseded	Emission revisions requested by WDEQ * and page numbering changes
Appendix F	1/4/08	Superseded	Updated coal storage BACT analysis
Appendix H	1/18/08	Addition	Added Incremental NO_x Removal Cost as Appendix H
Appendix I	2/12/08	Superseded	Revised to discuss far field modeling only (since near field modeling has been re-run)
Appendix J	2/12/08	Superseded	Moved and revised near field modeling discussions to Chapter 6; far field modeling description remains
Appendix N	1/18/08	Added	Added tabbed divider
Appendix O	2/13/08	Deleted	Delete Appendix O pages (see revised Appendix H)

* During a meeting on January 18, 2008, WDEQ requested emission changes to minimize recordkeeping and reporting requirements and simplify permit writing. For certain equipment, MBFP agreed to increase operating hours and base emission calculations on the highest-emitting fuel (natural gas) in order to streamline compliance. Consequently, potential emissions were increased. Notes reflecting actual equipment operations have been added to pertinent spreadsheets. WDEQ stated that BACT analyses would not be affected by these simplifying assumptions, and would instead be based on the actual operations of the equipment.

Figures 6.7, 6.8, and 6.9 illustrate maximum PSD increment impacts for 3-hour, 24-hour, and annual averaging times.

Table 6.10 – Predicted SO_2 Concentrations Compared to NAAQS / WAAQS

Averaging Period	Data Period			Receptor Location (m)		Predicted Cumulative Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (Cumulative + Background) (ug/m3)	NAAQS / WAAQS (ug/m3)
	Year	Month/ Day	Hour	East	North				
3 Hour [1]	2000	2/29	24	395455.4	4624205	305.53	31.4	336.93	N/A / 1300
	2001	2/8	24	395455.4	4624205	359.4	31.4	390.8	N/A / 1300
	2003	6/30	21	389455.4	4628205	393.87	31.4	425.27	N/A / 1300
	2004	5/16	06	388955.4	4627705	435.66	31.4	467.06	N/A / 1300
	2005	12/6	24	380955.4	4628205	397.15	31.4	428.55	N/A / 1300
24 Hour [1]	2000	11/30	24	392255.4	4625105	116.2	7.84	124.02	365 / 260
	2001	3/13	24	392955.4	4625205	160.66	7.84	168.5	365 / 260
	2003	12/13	24	391855.4	4625505	151.83	7.84	159.67	365 / 260
	2004	10/30	24	391955.4	4625005	162.51	7.84	170.35	365 / 260
	2005	11/13	24	392055.4	4625005	137.98	7.84	145.82	365 / 260
Annual	2000	N/A	N/A	391421.4	4624635	4.25	2.62	6.87	80 / 60
	2001	N/A	N/A	391421.4	4624585	4.51	2.62	7.13	80 / 60
	2003	N/A	N/A	391422.4	4624685	4.43	2.62	7.05	80 / 60
	2004	N/A	N/A	391420.4	4624485	4.01	2.62	6.63	80 / 60
	2005	N/A	N/A	391420.4	4624435	4.09	2.62	6.71	80 / 60

1. Based on the second-highest maximum.

Table 6.11 – Predicted SO_2 Concentrations Compared to PSD Increments

Averaging Period	Data Period			Receptor Location (m)		Predicted Concentration (ug/m3)	PSD Increment (ug/m3)
	Year	Month/Day	Hour	East	North		
3 Hour	2000	12/4	9	385955.4	4614205	249.87	512
	2001	1/25	9	382955.4	4621205	257.11	512
	2003	12/5	9	380955.4	4625205	337.92	512
	2004	10/15	18	380955.4	4625205	291.23	512
	2005	2/18	9	380955.4	4628205	268.77	512
24 Hour	2000	9/23	24	389455.4	4624205	86.49	91
	2001	8/9	24	389655.4	4624605	86.36	91
	2003	4/1	24	391855.4	4625805	78.28	91
	2004	6/8	24	389755.4	4624205	72.69	91
	2005	8/4	24	389855.4	4624805	77.64	91
Annual	2000	N/A	N/A	391421.4	4624635	4.25	20
	2001	N/A	N/A	391421.4	4624585	4.51	20
	2003	N/A	N/A	391422.4	4624685	4.43	20
	2004	N/A	N/A	391420.4	4624485	4.01	20
	2005	N/A	N/A	391420.4	4624435	4.09	20

Figure 6.7 – 2003 Maximum SO_2 3-Hour Impacts (PSD)

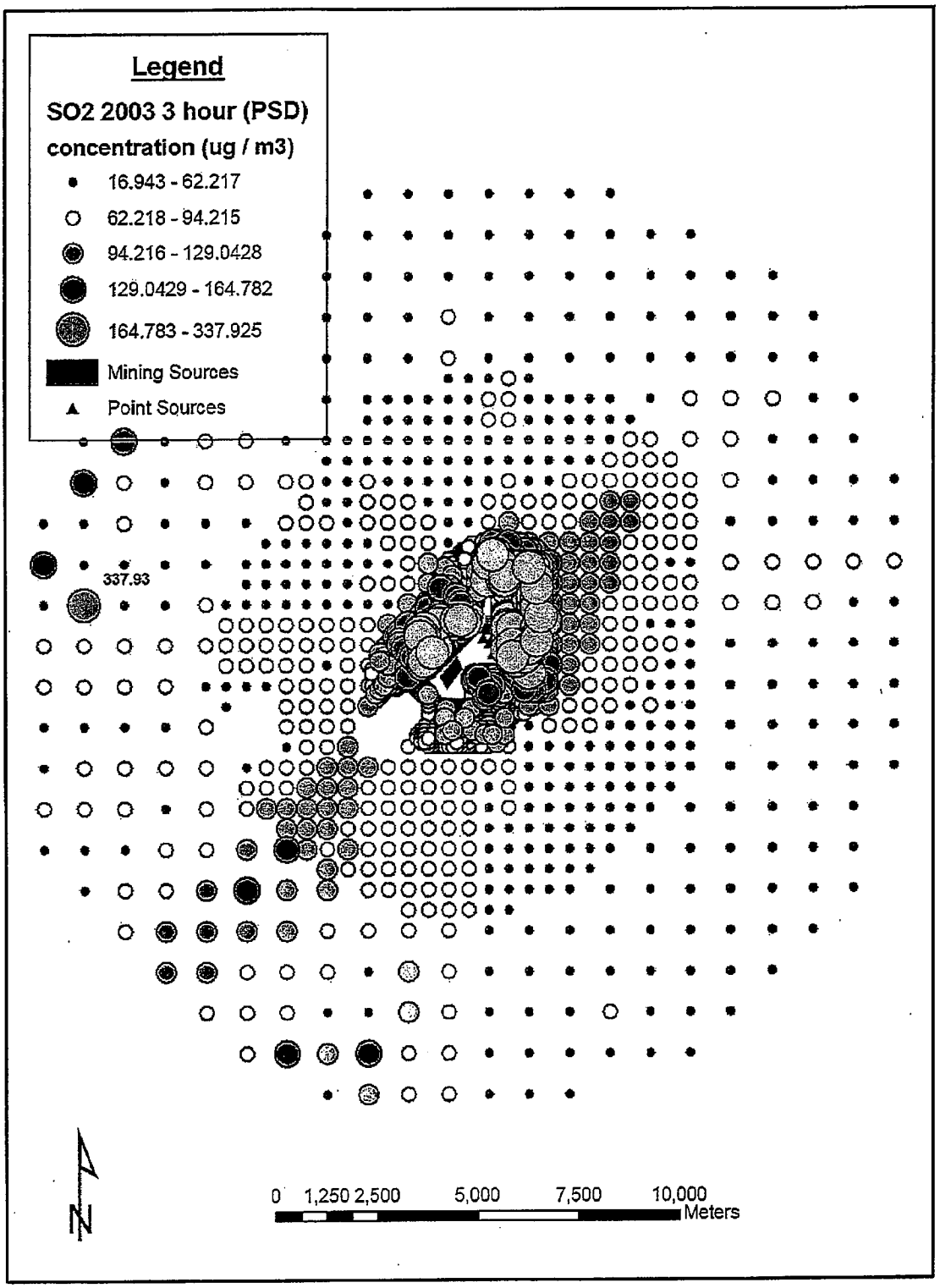


Figure 6.8 – 2000 Maximum SO_2 24-Hour Impacts (PSD)

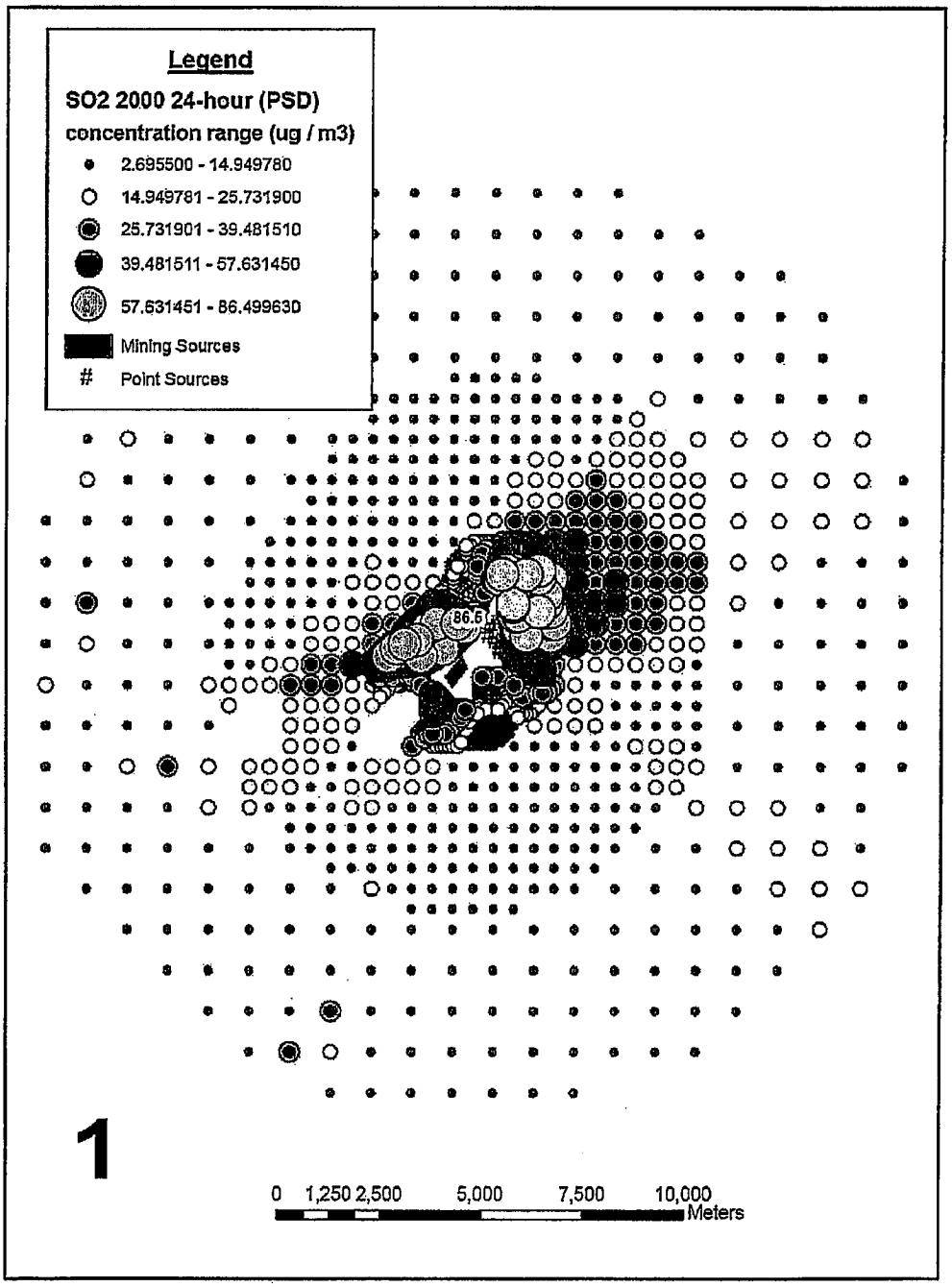
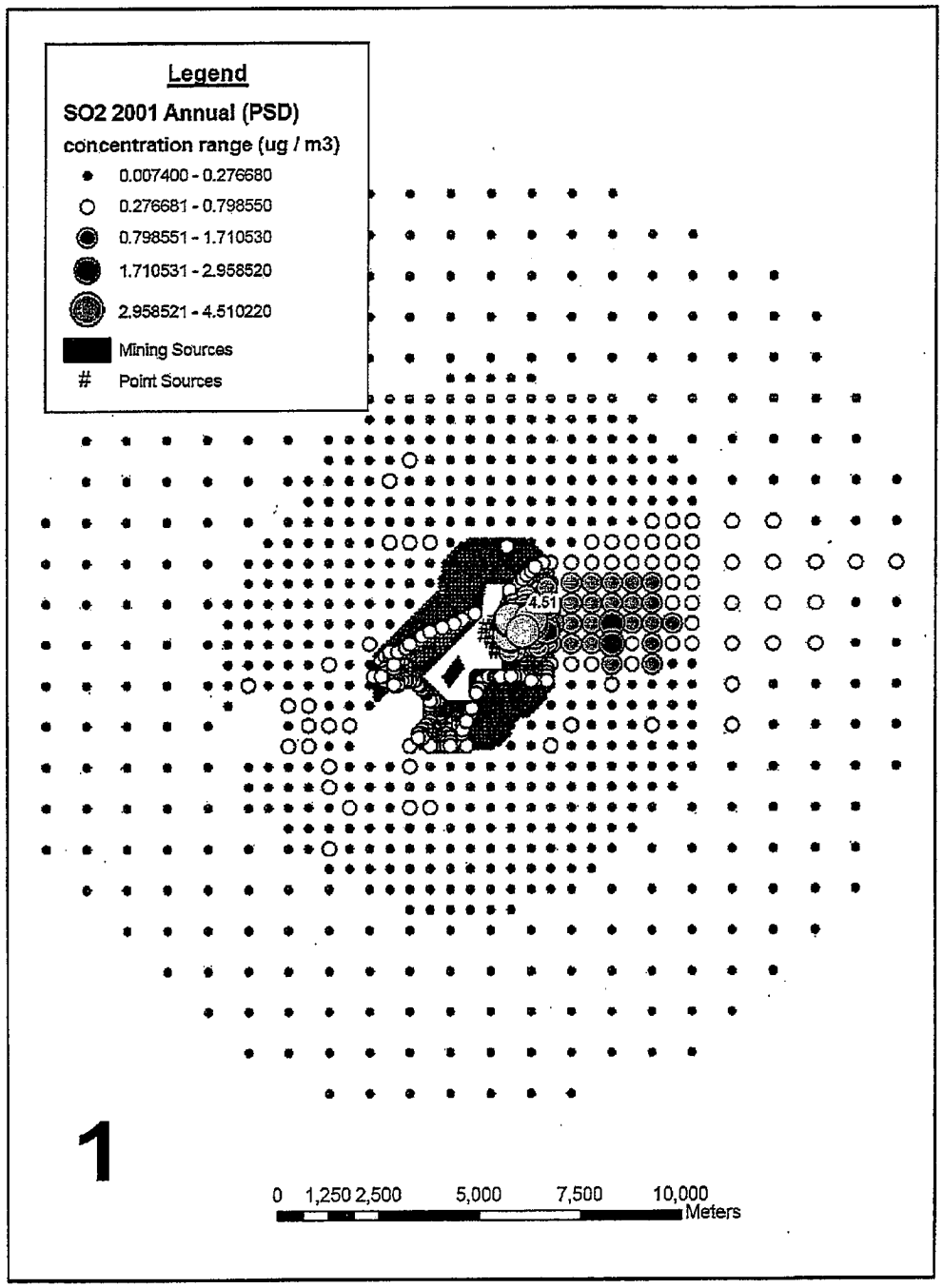


Figure 6.9 – 2001 Maximum SO_2 Annual Impacts (PSD)



6.6.2 PM/PM_{10} Modeling Demonstration

Table 6.12 presents the maximum predicted 24-hour and annual average cumulative PM/PM_{10} concentrations compared to the NAAQS and WAAQS. Emissions in this analysis include nearby mining operations and vehicle traffic and the proposed Plant. The predicted second-highest 24-hr value is presented, along with the highest predicted maximum annual value. Each of these values is added to the respective 24-hr and annual background concentration for comparison to the NAAQS and WAAQS. As shown in the table, all predicted total concentrations are below the respective NAAQS and WAAQS values.

Table 6.13 presents the results of the PM/PM_{10} PSD increment analysis. The maximum predicted 24-hr and annual PM/PM_{10} values are compared to the respective PSD increment. As shown in the table, all predicted concentrations are below the applicable PSD increment value.

Table 6.12 – Predicted PM/PM_{10} Concentrations Compared to NAAQS / WAAQS

Averaging Period	Data Period			Receptor Location (m)		Predicted Cumulative Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (Cumulative + Background) (ug/m3)	NAAQS / WAAQS (ug/m3)
	Year	Month / Day	Hour	East	North				
Annual	2000	N/A	N/A	390604.4	4623395	15.36	26	41.36	NA / 50
	2001	N/A	N/A	390604.4	4623395	17.75	26	43.75	NA / 50
	2003	N/A	N/A	390604.4	4623395	12.59	26	38.59	NA / 50
	2004	N/A	N/A	390604.4	4623395	17.82	26	43.82	NA / 50
	2005	N/A	N/A	390604.4	4623395	19.03	26	45.03	NA / 50
24 Hour	2000	11/23	24	389455.4	4622605	73.53	56	129.53	150 / 150
	2001	3/3	24	390604.4	4623395	85.41	56	141.41	150 / 150
	2003	2/24	24	389728.4	4622696	72.48	56	128.748	150 / 150
	2004	10/4	24	389445.4	4622979	74.35	56	130.35	150 / 150
	2005	9/13	24	390603.4	4623295	82.04	56	138.04	150 / 150

Table 6.13 – Predicted PM/PM_{10} Concentrations Compared to PSD Increments

Averaging Period	Data Period			Receptor Location (m)		Predicted Concentration (ug/m3)	PSD Increment (ug/m3)
	Year	Month / Day	Hour	East	North		
Annual	2000	N/A	N/A	390604.4	4623395	4.77	17
	2001	N/A	N/A	390604.4	4623395	5.48	17
	2003	N/A	N/A	390604.4	4623395	3.52	17
	2004	N/A	N/A	390604.4	4623395	5.62	17
	2005	N/A	N/A	390604.4	4623395	6.15	17
24 Hour	2000	12/8	24	390455.4	4622405	26.19	30
	2001	3/3	24	390604.4	4623345	26.42	30
	2003	3/28	24	390604.4	4623395	22.04	30
	2004	2/21	24	390604.4	4623345	24.56	30
	2005	2/24	24	390603.4	4623245	27.46	30

Figures 6.10 and 6.11 illustrate maximum PSD increment impacts for 24-hour and annual averaging times.

Figure 6.10 – 2005 Maximum PM_{10} 24-Hour Impacts (PSD)

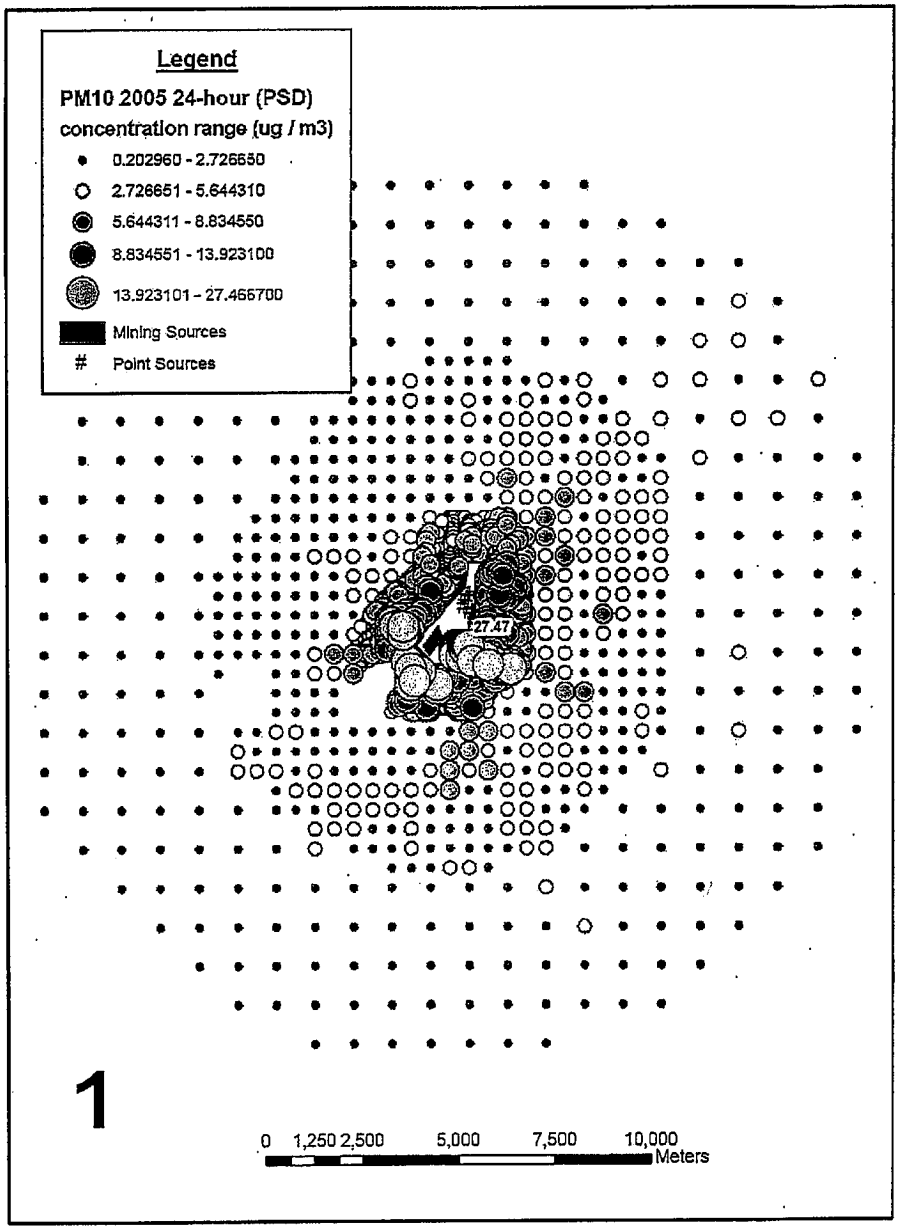
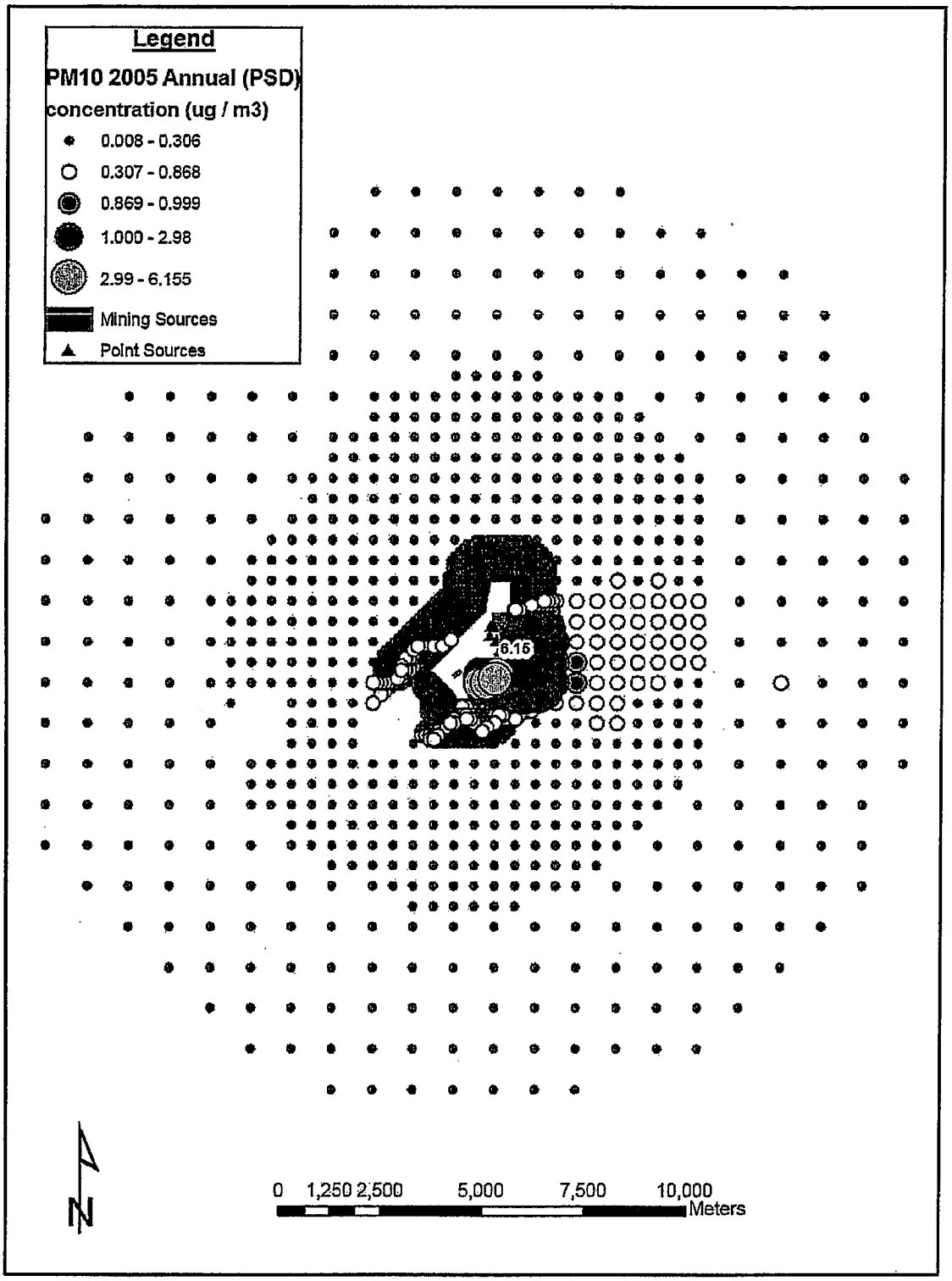


Figure 6.11 – 2005 Maximum PM_{10} Annual Impacts (PSD)



6.6.3 CO Modeling Demonstration

Table 6.14 presents the maximum predicted 1-hour and 8-hour average cumulative CO concentrations compared to the NAAQS and WAAQS. Emissions in this analysis include nearby point sources (from WDEQ emission inventory data), nearby mining operations and vehicle traffic, and the proposed Plant. The maximum predicted second-high values are presented and added to the respective 1-hour and 8-hour background concentrations for comparison to the NAAQS and WAAQS. As shown in the table, all predicted total concentrations are below the respective NAAQS and WAAQS values. No PSD increment analysis was conducted for CO, as no PSD increments exist for CO.

Table 6.14 – Predicted CO Concentrations Compared to the NAAQS / WAAQS

Averaging Period	Data Period			Receptor Location (m)		Predicted Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (Predicted + Background) (ug/m3)	NAAQS & WAAQS (ug/m3)
	Year	Month / Day	Hour	East	North				
8 Hour	2000	10/3	24	392955.4	4622205	3366.56	916	4,282.56	10,000
	2001	8/3	08	392455.4	4622705	4321.5	916	5,237.5	10,000
	2003	4/11	08	390255.4	4621705	3674.5	916	4,590.5	10,000
	2004	7/26	08	392955.4	4622205	3098.76	916	4,014.76	10,000
	2005	8/8	08	392455.4	4622705	3443.05	916	4,359.05	10,000
1 Hour	2000	10/23	24	392955.4	4622205	26917.83	1946	28,863.83	40,000
	2001	8/3	05	392455.4	4622705	33584.77	1946	35,530.77	40,000
	2003	7/15	04	390355.4	4621705	27086.87	1946	29,032.87	40,000
	2004	5/10	01	392455.4	4621705	21204.38	1946	23,150.38	40,000
	2005	8/8	04	392455.4	4622705	27289.27	1946	29,235.27	40,000

Figures 6.12 and 6.13 illustrate the second high CO 1-hour impacts with respect to the NAAQS and WAAQS.

Figure 6.12 – 2001 Second High CO 1-Hour Impacts (NAAQS)

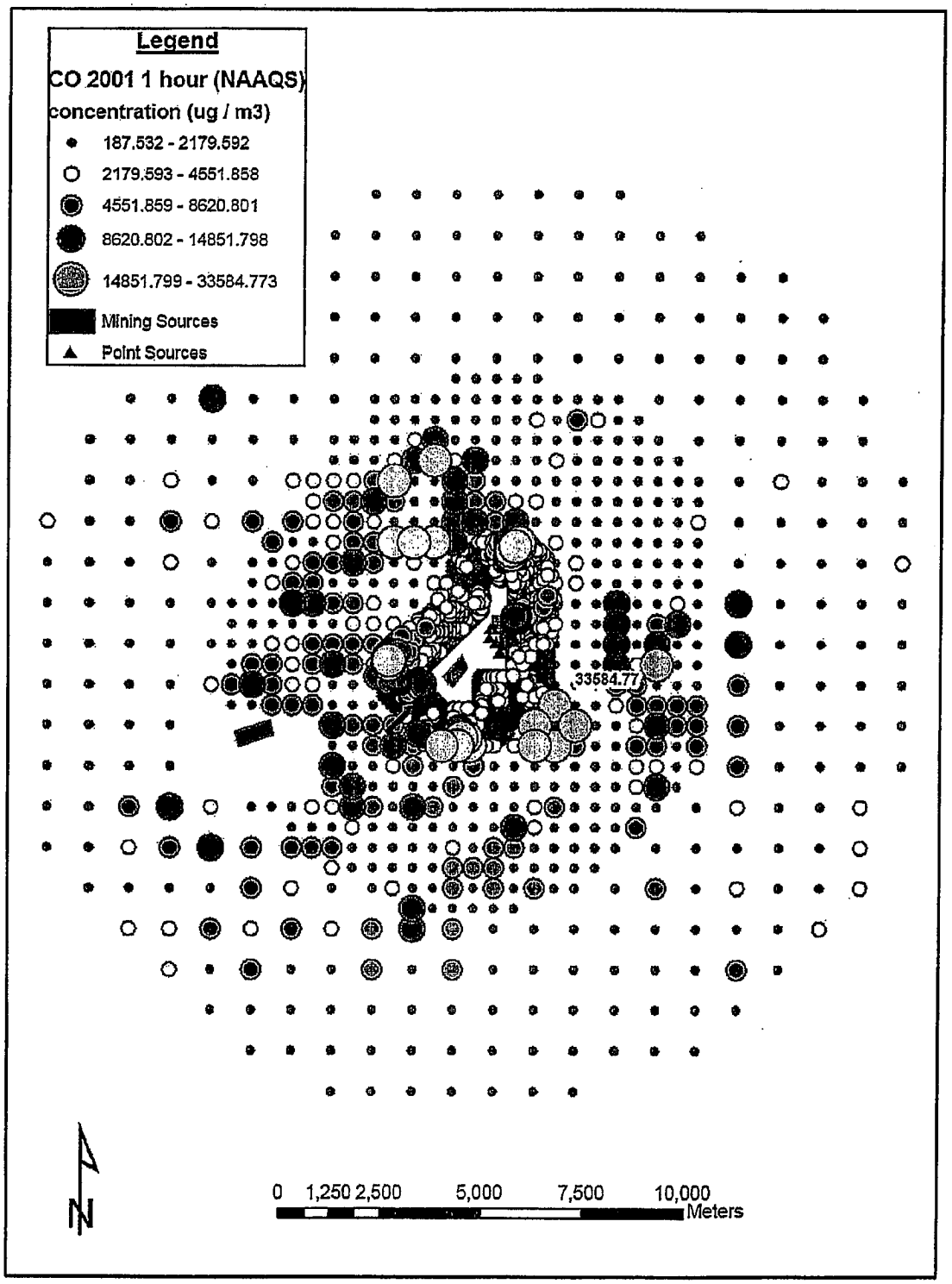
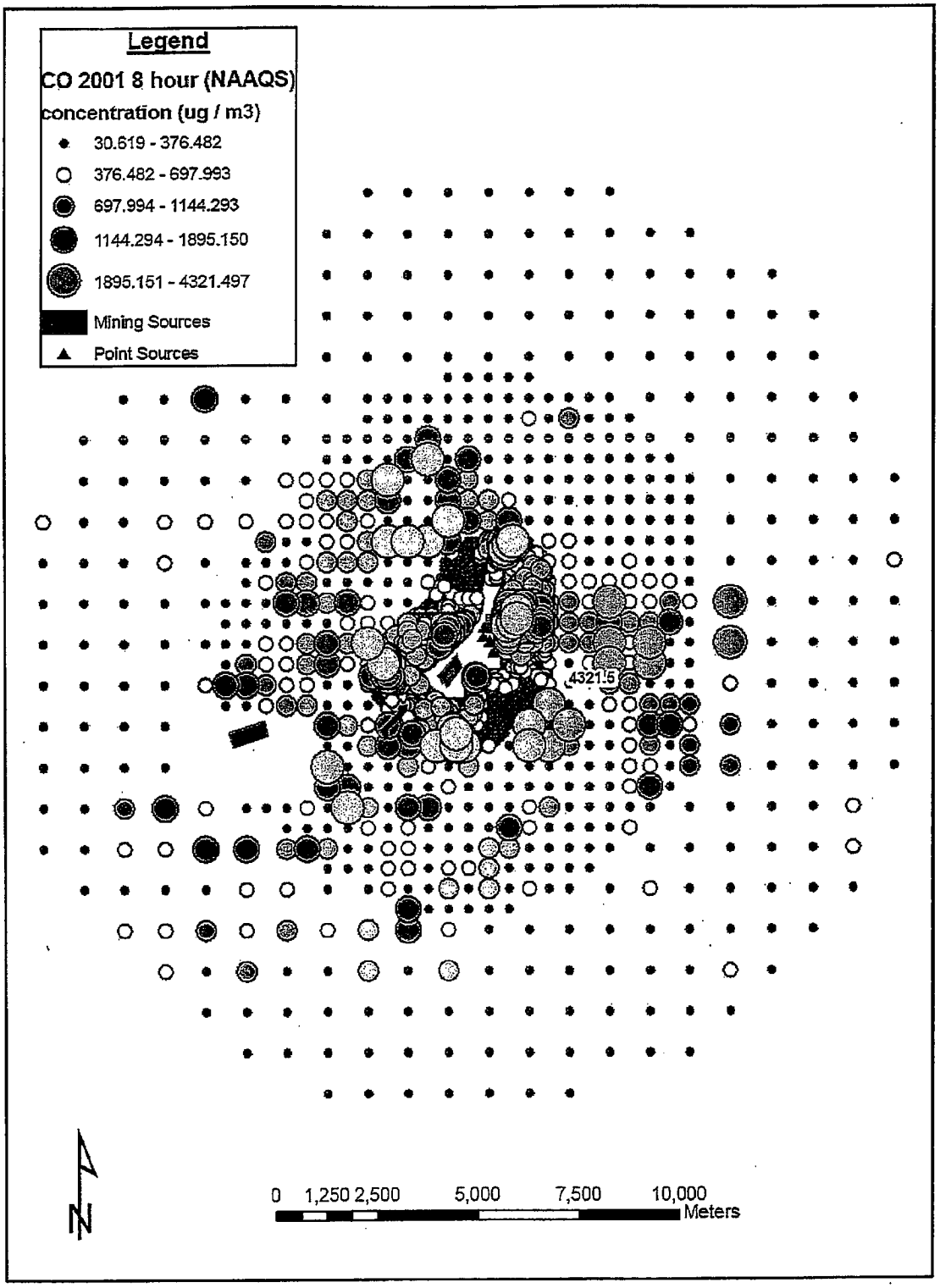


Figure 6.13 – 2001 Second High CO 8-Hour Impacts (NAAQS)



6.6.4 NO_x Modeling Demonstration

Table 6.15 presents the maximum predicted annual average NO_x concentrations compared to the NAAQS, WAAQS, and the NO_x PSD increment value. Emissions in this analysis include nearby point sources (from WDEQ emission inventory data), nearby mining operations and vehicle traffic, and the proposed Plant. The maximum predicted annual average concentrations are presented and added to the background concentration for comparison to the NAAQS and WAAQS. As shown in the table, all predicted total concentrations are well below the respective PSD increments, and the total concentrations fall well below the NAAQS and WAAQS.

Table 6.15 – Predicted NOx Concentrations Compared to the PSD Increment, NAAQS, and WAAQS

Averaging Period	Data Period	Receptor Location (m)		Predicted Concentration (ug/m3)	PSD Increment (ug/m3)	Background Concentration (ug/m3)	Total Concentration (Predicted + Background) (ug/m3)	NAAQS & WAAQS (ug/m3)
		East	North					
Annual	2000	389455.4	4622605	12.68	25	9.43	22.11	100
	2001	389455.4	4622605	12.80	25	9.43	22.23	100
	2003	389455.4	4622605	11.48	25	9.43	20.91	100
	2004	390604.4	4623395	11.60	25	9.43	21.03	100
	2005	390604.4	4623395	12.16	25	9.43	21.59	100

Figure 6.14 illustrates the maximum annual NO_x impacts.

Table 6.16 – Source HAP Short-Term (Maximum) Emission Rates

Source ID 1 (in model)	Formaldehyde (g/sec)	Benzene (g/sec)	Methanol g/sec)	n - Hexane (g/sec)	Toluene (g/sec)	Ethyl benzene (g/sec)	Xylene (g/sec)
CTG1	0.007	0.0012	0.0	0.0	0.013	0.00317	0.0063
CTG2	0.007	0.0012	0.0	0.0	0.013	0.00317	0.0063
CTG3	0.007	0.0012	0.0	0.0	0.013	0.00317	0.0063
GHEAT1	0.000195	0.0000054	0.0	0.00467	0.0000088	0.0	0.0
GHEAT2	0.000195	0.0000054	0.0	0.00467	0.0000088	0.0	0.0
GHEAT3	0.000195	0.0000054	0.0	0.00467	0.0000088	0.0	0.0
GHEAT4	0.000195	0.0000054	0.0	0.00467	0.0000088	0.0	0.0
GHEAT5	0.000195	0.0000054	0.0	0.00467	0.0000088	0.0	0.0
Z8901	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BSG1	0.1297	0.00052	0.0	0.000273	0.001	0.0	0.00045
BSG2	0.1297	0.00052	0.0	0.000273	0.001	0.0	0.00045
FIREPUMP	0.00057	0.00045	0.0	0.0	0.0002	0.0	0.000128
AB	0.00061	0.000017	0.0	0.0147	0.000028	0.0	0.0
REGH	0.0002	0.0000056	0.0	0.0048	0.000009	0.0	0.0
REAH	0.000115	0.0000032	0.0	0.00277	0.0000052	0.0	0.0
HGT	0.000021	0.0000006	0.0	0.0005	0.0000009	0.0	0.0
Z8902	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BSG3	0.1297	0.00052	0.0	0.000273	0.001	0.0	0.00045
CO2V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
T_A	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_B	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_C	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_D	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_E	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_F	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_G	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_H	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_I	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_J	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
T_K	0.0	0.00138	0.00624	0.0013	0.0015	0.000099	0.00042
V1	0.0	0.3	0.3	0.0	0.0	0.0	0.0

1. Tanks are shown as sources T_A through T_K. V1 is the equipment leak volume source.

6.7.3 HAP Modeling Results

6.7.3.1 Maximum 1-Hour HAP Concentrations

Table 6.17 shows the highest short-term (1-hour) averaged concentrations using worst-case assumptions and the corresponding RELs. Each of the seven modeled HAPs has a predicted maximum 1-hour concentration well below the applicable REL.

Table 6.17 – Source HAP Emission Rates

HAP	Maximum 1-hour Averaged Modeled Concentrations (µg/m³)	Reference Exposure Levels (RELs) (µg/m³)
Benzene[1]	311.5	1,300
Toluene[1]	5.73	37,000
Ethylbenzene[2]	0.38	35,000
Xylene[1]	1.61	22,000
n-Hexane[2]	4.98	39,000
Formaldehyde[1]	80.37	94
Methanol[1]	311.5	28,000

1. EPA Air Toxics Database, Table 2 (EPA, 2005b).

2. No REL available for these HAPs. Values shown are from (IDLH/100) EPA Air Toxics Database, Table 2 (EPA, 2005b).

6.7.3.2 Maximum Annual HAP Concentrations

Annually averaged modeled HAP concentrations due to normal operations were compared to the Reference Concentrations for Chronic Inhalation (RfCs). An RfC is defined by the EPA as the daily inhalation concentration (maximum annually averaged for this analysis) at which no long-term adverse health effects are expected. RfCs exist for both non-carcinogenic and carcinogenic effects on human health (EPA, 2005b). Annually averaged modeled benzene, methanol, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde concentrations were compared to the non-carcinogenic RfCs shown in Table 6.18. Maximum annual predicted concentrations are well below the applicable RFCs for each pollutant.

Table 6.18 – Annually Averaged Modeled Concentrations

HAP	Maximum Annually Averaged Modeled Concentrations (µg/m³)	Non-Carcinogenic (RfCs) (µg/m³)[1]
Benzene	13.56	30
Toluene	0.101	400
Ethyl benzene	0.007	1000
Xylene	0.028	100
n-Hexane	0.117	200
Formaldehyde	0.042	9.8
Methanol	13.61	4000

1. EPA Air Toxics Database, Table 1 (EPA, 2005c).

6.7.3.3 Carcinogen Analysis

RfCs for suspected carcinogens benzene and formaldehyde are expressed as unit risk factors (URS) and accepted methods for risk assessment are used to evaluate the incremental cancer risk for these pollutants. Since the closest residence, viewed in aerial photographs, is 3.3 km to the

south of the Plant, the maximum annually averaged modeled concentration predicted at a distance of 3 km and beyond for Benzene and the maximum annually averaged modeled concentration for Formaldehyde are multiplied by EPA's URFs (based on 70-year exposure), and then multiplied by an adjustment factor which represents the ratio of projected exposure time to 70 years.

The adjustment factors represent two scenarios: a most likely exposure (MLE) scenario and one reflective of the maximally exposed individual (MEI). The MLE duration is assumed to be 9 years, which corresponds to the mean duration that a family remains at a residence (EPA, 1993). This duration corresponds to an adjustment factor of 9/70 = 0.13. The duration of exposure for the MEI is assumed to be 70 years and the corresponding adjustment factor is 1.0.

A second adjustment is made for time spent at home versus time spent elsewhere. For the MLE scenario, the at-home time fraction is 0.64 (EPA, 1993), and it is assumed that during the rest of the day the individual will remain in an area where annually averaged HAP concentrations would be one-quarter as large as the maximum annual average concentration. Therefore, the MLE adjustment factor is calculated as follows.

$$\text{MLE Adjustment Factor} = (0.13) \times [(0.64 \times 1.0) + (0.36 \times 0.25)] = 0.095.$$

The MEI scenario assumes that the individual is at home 100 percent of the time, for the final adjustment factor of (1.0 x 1.0) = 1.0.

The values for the cancer risk assessment from benzene and formaldehyde emissions from the proposed Plant are shown in Table 6.19.

Table 6.19 – Cancer Risk Assessment Values

Analysis[1]	HAP	Carcinogenic RfC (Risk Factor)[2] (1/µg/m³)	Exposure Adjustment Factor	Maximum Annually Averaged Modeled Concentrations (µg/m³)	Estimated Long-Term Exposure Risk
MLE	Benzene	7.80E-06	0.095	0.21611	1.60E-07
MLE	Formaldehyde	5.50E-09	0.095	0.00615	3.21E-12
MEI	Benzene	7.80E-06	1	0.21611	1.69E-06
MEI	Formaldehyde	5.50E-09	1	0.00615	3.38E-11

1. EPA Air Toxics Database, Table 1 (EPA, 2005c).

Figures 6.15 and 6.16 show the receptor locations with respect to the Plant including the maximum annually averaged concentrations for benzene for each receptor. Concentration ranges are colored based on the incremental cancer risk analysis. Figure 6.15 corresponds to the MLE and Figure 6.16 corresponds to the MEI. Each blue dot represents receptors that have concentrations that are at a 1×10^{-6} (1-in-a-million) risk or greater of developing cancer. Yellow receptors indicate a lower risk of developing cancer. Formaldehyde concentrations do not translate to the 1×10^{-6} risk threshold and therefore are not shown graphically.

For the MLE analysis; a concentration of 1.349528 µg/m^3 corresponds to a 1×10^{-6} risk of developing cancer due to benzene exposure from Plant emissions.

Figure 6.15 – MLE Receptors for Benzene