Mine Site Class II Air Quality Dispersion Modeling Report

Version 2

August 2012

NorthMet Project

PolyMet Mining Incorporated

Hoyt Lakes, MN

This document provides the Class II dispersion modeling report for the Mine Site in the format requested by the Minnesota Pollution Control Agency (MPCA). This includes MPCA form AQDMR-01 and seven figures. The figures are listed below.

Figures:

Figure 1 EIS Cumulative NAAQS-Increment Receptor Grid
Figure 2 24 Hour PM10 Increment Year 8 Results
Figure 3 24 Hour PM10 Increment Year 13 Results
Figure 4 24 Hour PM10 NAAQS Year 8 Results
Figure 5 24 Hour PM10 NAAQS Year 13 Results
Figure 6 24 Hour PM25 NAAQS Year 8 Results
Figure 7 24 Hour PM25 NAAQS Year 13 Results

In addition to this document, requested electronic files will be provided via the Project Air FTP Site. The electronic files will include updated emission calculation spreadsheets for the Mine Site and the nearby sources.

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

AQDMR-01

Air Quality Dispersion Modeling Report(AQDMR)

Protocol Form for Criteria Pollutant Modeling

Doc Type: Air Dispersion Modeling

Acronym Information on Page 6

Instructions: Permit applicants required to conduct air dispersion modeling should submit two paper copies of the completed Air Quality Dispersion Modeling Report form (AQDMR-01) and all accompanying files to:

Air Quality Permit Document Coordinator
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Applicants may also submit an electronic version in addition to the two paper copies.

Electronic copies of the forms and accompanying files should be sent to: AirModeling.PCA@state.mn.us.

Facility Information

AQ tracking number: _____

AQ file no.: _____ AQ facility/permit ID no.: _____ Today's date (mm/dd/yyyy): 8/27/2012

Three-letter modeling facility ID (ex., XEK = Xcel Energy Allen S. King, MEC = Mankato Energy Center, etc.): PMM

Facility name: PolyMet Mining Inc.

Facility street address: 6500 County Road 666

City: Hoyt Lakes County: St. Louis

State: MN Zip code: 55750 Elevation at facility: 493 m

Facility contact: Kevin Pylka Protocol prepared by: Jennifer Koenen, Barr Engineering Co.

Facility contact phone: (218) 471 - 2162 Preparer phone: (952) 832 - 2682

Facility contact e-mail address: kpylka@polymetmining.com Preparer e-mail address: jkoenen@barr.com

Latitude, Longitude of facility (Decimal degrees to **four** decimal places): 47.6141 N, 91.9690 W

UTM coordinates of facility (NAD83, zone 15 extended **only**): x = 577,480.00 m East, y = 5,273,931.00 m North

This report is associated with:

- ☐ Permit application
- ☐ Permit requirement
- ☒ Other: EIS

Project Description (50 words or less)

PolyMet plans to construct and operate a mine (subject of this protocol), to reactivate portions of the LTV Steel Mining Company facility and to build a hydrometallurgical concentrate processing facility at the former LTVSMC site. More detail is available in the NorthMet Project Description Version 3 Submitted September 13, 2011.

Files to Accompany Modeling Report

Include the following files with the completed modeling report form. Use checkbox to indicate that all applicable files are included.

1. ☒ AERMOD input files (*.inp, *.adi, *.ami)
   ☒ AERMOD output files (*.out, *.ado, *.amo)
   ☒ AERMOD plot files (*.plt)
   ☒ AERMOD post files (*.pst) – If applicable
   ☒ AERMOD event files (*.evi, *.evo) – If applicable

☒ AERMOD miscellaneous/other files (MAXDCONT, ?, ?, etc.) – If applicable

2. AERMET files: ☒ *.sfc ☒*.pfl
3. BPIP-PRIME files: ☒ Input (*.bpi) ☒ Output (*.bpo, *.sum)
4. AERMAP files: ☒ Terrain (*.dem(s), *.tif (NED files)), ☐ Input (*.ami), ☒ Output (*.rou, *.sou, etc.)
5. Background data files: ☒ Background concentrations for applicable pollutants (seasonal, monthly, daily, hourly, etc.)
6. Modeling Results: ☒ Figures (*.jpeg, *.pdf), ☐ GIS Maps (*.shp)
7. AQDMPS-01 spreadsheet*: ☐
8. Other files and supporting documents (SMSv*.xls, Far sources, readme, etc.):

   The final PolyMet Mine Site emission inventory will be included with this report in lieu of the AQDMPS-01 spreadsheet as stated in the approved modeling protocol.

* *Provide the final spreadsheet (i.e. AQDMPS-01) and indicate/highlight changes.*

Section 1. Modeling Protocol

1. The Air Dispersion Modeling presented in this report is based on a Protocol that has been:

   ☒ Approved ☐ Conditionally approved ☒ *MPCA approval date (mm/dd/yyyy): Ruth Roberson Review: 3/19/2012; Sarah Seelen Review: 3/26/2012; Approval Email Sent: 3/27/2012

   **This is the date given on AQDM PAN-01 form*

2. Does this Modeling submittal **completely** follow the Approved Protocol? ☐ Yes ☒ No

   If yes, proceed to Section 3.

   If no, proceed to Section 2.

Section 2. Changes to Modeling Protocol

Table 1: Protocol Changes (Please indicate which sections in Approved Protocol contain changes.)

Modeling protocol by sections

Section and section name	Change/No change
Files to accompany protocol	No Change
Section A *Purpose for Air Dispersion Modeling and Related Information*	No Change
Section B *EPA Pre-Processors and EPA Post-Processors*	No Change
Section C *Model Selection and Options (Key CO Pathway Inputs)*	Change
Section D *Emission Source Characterizations and Parameters (Key SO Pathway Inputs)*	Change
Section E *Paved Roads Fugitive Dust (as per MPCA April 25, 2011 Policy)*	No Change
Section F *Receptors (RE Pathway)*	Change
Section G *Meteorological Data (ME Pathway)*	No Change
Section H *SIL Analysis and Results*	No Change
Section I *Background Values*	No Change
Section J *Nearby Sources*	Change
Section K	Change

Anticipated Outputs (OU Pathway)	

Section 2.1: Detailed Changes to Modeling Protocol

Please provide specific information corresponding to those sections in Table 1 where changes are indicated.

Section A. Purpose for air dispersion modeling and related information

MPCA approved change: ☐ Yes ☐ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

Section B. EPA pre-processors and EPA post-processors

MPCA approved change: ☐ Yes ☐ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

Section C. Model selection and options (Key CO pathway inputs)

MPCA approved change: ☒ Yes ☐ No Date (mm/dd/yyyy): 8/21/12

Describe changes and/or indicate section item number(s):

1. AERMOD version 12060 will be used. MPCA report review form for version 1 of this report indicated that this change was acceptable.

Section D. Emission source characterizations and parameters (Key SO pathway inputs)

MPCA approved change: ☐ Yes ☒ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

1b. Category 1 year 20 stockpile haul road revised, so haul length changed and number and location of volume sources making up the haul road was updated. This change was included in the emission inventory submitted with version 1 of this report. MPCA did not comment on these changes.

8. The source groups for the PM2.5 NAAQS modeling were also slightly changed and renamed. The source groups included are: ALL, NOPMP, NOMN, NONSM, PMM, and NSM.

Section E. Paved roads fugitive dust

MPCA approved change: ☐ Yes ☐ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

Section F. Receptors (RE pathway)

MPCA approved change: ☐ Yes ☒ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

6. The receptor grid did not change from the protocol, however, the property ownership and tax records were evaluated to determine an appropriate ambient air boundary for Northshore Peter Mitchell Mine, so its impacts would not be evaluated on its own property. Figure 1 with this report is a revised protocol Figure 6 with the Peter Mitchell Mine property receptors highlighted.

Section G. Meteorological data (ME pathway)

MPCA approved change: ☐ Yes ☐ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

Section H. SIL analysis and results

MPCA approved change: ☐ Yes ☐ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

Section I. Background values

MPCA approved change: ☐ Yes ☐ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

Section J. Nearby sources

MPCA approved change: ☒ Yes ☐ No Date (mm/dd/yyyy): 8/7/2012

Describe changes and/or indicate section item number(s):

Revised emission rates for the Northshore Mining Company Peter Mitchell Mine have been agreed upon with MPCA. Revised calculations are included with the neaby source spreadsheet provided electronically.

Section K. Anticipated outputs (OU pathway)

MPCA approved change: ☐ Yes ☒ No Date (mm/dd/yyyy): _____

Describe changes and/or indicate section item number(s):

1. The plot file names listed in the Section K Attachment of the protocol have been updated with the final report. The DVD containing the modeling files for the PolyMet Mine Site contains a readme.txt file outlining the nomenclature of the AERMOD input, output, and plot files.

Section 3. Paved Roads Fugitive Dust (Optional)

Facilities that have indicated in AQDMP-01 form the exclusion of paved roads in the air dispersion modeling should provide the results of that modeling in Table 1. (See the AQDMP-01 form for details.)

Table 1: Paved Road Dust modeling results

	Averaging Period	NAAQS ($\mu g/m^3$)	Total Modeled NAAQS Concentration (includes Background and Nearby Sources) (ug/m^3)	% of NAAQS	PSD Class II Increments ($\mu g/m^3$)	Modeled Class II Increment Impact Concentrations ($\mu g/m^3$)	% of Class II Increments
PM_{10}	24-hour	150		0.00%	30		0.00%
	Annual	50		0.00%	17		0.00%
$PM_{2.5}$	24-hour	35		0.00%	9		0.00%
	Annual	15		0.00%	4		0.00%

Section 4. Modeling Results

Table 2: Pollutants and averaging periods (Indicate with an "X" all pollutant and averaging period(s) modeled.)

Pollutant	Averaging Period	Standard		Increment
		NAAQS	MAAQS	
CO	1-hr			
	8-hr			

Lead	Rolling 3 mo. Avg			
	Quarterly Avg			
NO_2	1-hr			
	Annual			
SO_2	1-hr			
	3-hr			
	24-hr			
	Annual			
PM_{10}	24-hr	X	X	X
	Annual	X	X	X
$PM_{2.5}$	24-hr	X	X	
	Annual	X	X	

Table 3: NAAQS/MAAQS modeling results (Enter modeling results along with the percent of standard.)

Pollutant	Averaging period	NAAQS standard (ug/m^3)	MAAQS standard (ug/m^3)	Total modeled concentration (includes background and nearby sources) (ug/m^3)	Percent of standard (%)	
					NAAQS	MAAQS
CO	1-hr	40,000	35,000			
	8-hr	10,000	10,000			
Lead	Rolling 3 mo. Avg	0.15	***			
	Quarterly Avg	1.5	1.5			
NO_2	1-hr	188	***			
	Annual	100	100			
SO_2	1-hr	196	1300			
	3-hr	***	1300/*915			
	24-hr	365	365			
	Annual	80	60			
PM_{10}	24-hr	150	150	88.4	59%	59%
	Annual	***	50	28.5	57%	57%
$PM_{2.5}$	24-hr	35	65	32.5	93%	50%
	Annual	15	15	10.4	69%	69%

**SO2 3-hr for Northern Minnesota is 915 ug/m3.*

Table 4: Increment modeling results (Provide the increment modeling results along with the percent of standard.)

Pollutant	Averaging Period	Class II Increment (ug/m^3)	Total Modeled Concentration (includes other increment sources) (ug/m^3)	Percent of Standard (%)
NO_2	1-hr	***		
	Annual	25		
SO_2	1-hr	***		
	3-hr	512		
	24-hr	91		
	Annual	20		
PM_{10}	24-hr	30	26.9	90%
	Annual	17	5.5	32%
$PM_{2.5}$	24-hr	9		
	Annual	4		

Section 5. Discussion

Enter any discussion comments:

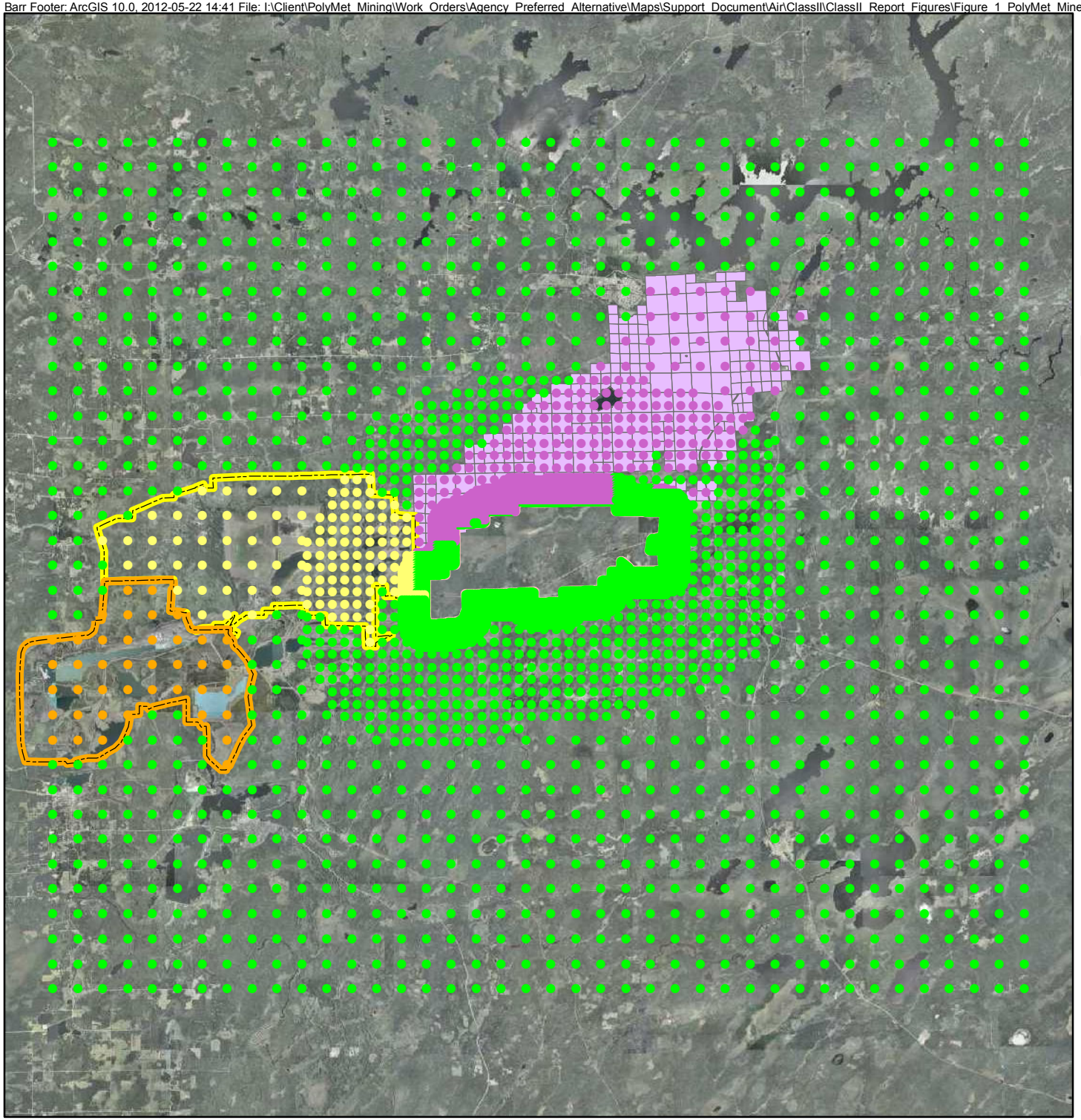
Section 6. Modeling Results Figures/Maps

Insert a figure or map showing the facility emission sources, receptors, and the location of the modeled maximum concentration(s) for each applicable pollutant, corresponding averaging periods, and operating scenarios. Figures or maps should correspond to Section 3 NAAQS and Increment results.

[Paste here]

Acronyms

$\mu g/m^3$	Micrograms per cubic meter
AERMAP	AERMOD Terrain Preprocessor
AERMET	AERMOD Meteorological Preprocessor
AERMOD	AMS/EPA Regulatory Model
AQ	Air Quality
AQDMP-01	Air Quality Dispersion Modeling Protocol form
AQDMPS-01	Air Quality Dispersion Modeling Protocol Spreadsheet
BPIP-PRIME	Building Profile Input Program for PRIME
CO	Carbon Monoxide
EPA	U.S. Environmental Protection Agency
FAC	3-letter facility ID
MAAQS	Minnesota State Ambient Air Quality Standard
MPCA	Minnesota Pollution Control Agency
NAAQS	National Ambient Air Quality Standard
NO_2	Nitrogen Dioxide
OU	Operable Unit
Pb	Lead
PM_{10}	Particulate Matter less than 10 um in size
$PM_{2.5}$	Particulate Matter less than 2.5 um in size
PRIME	Plume Rise Model Enhancements
PSD	Prevention of Significant Deterioration Program
SIL	Significant Impact Level
SO_2	Sulfur Dioxide
SIP	State Implementation Plan
SMS	Standardized Mobile Source
UG/M3	Micrograms per cubic meter ($\mu g/m^3$)
UTM	Universal Transverse Mercator



- Cumulative Receptors
- Mesabi Nugget
- NorthMet Plant Site
- NorthShore Mine
- Mesabi Nugget AAB
- NorthMet Plant Site AAB
- St Louis County Tax Records

**Northshore Peter Mitchell Mine on-site receptors based on St. Louis County tax property records.

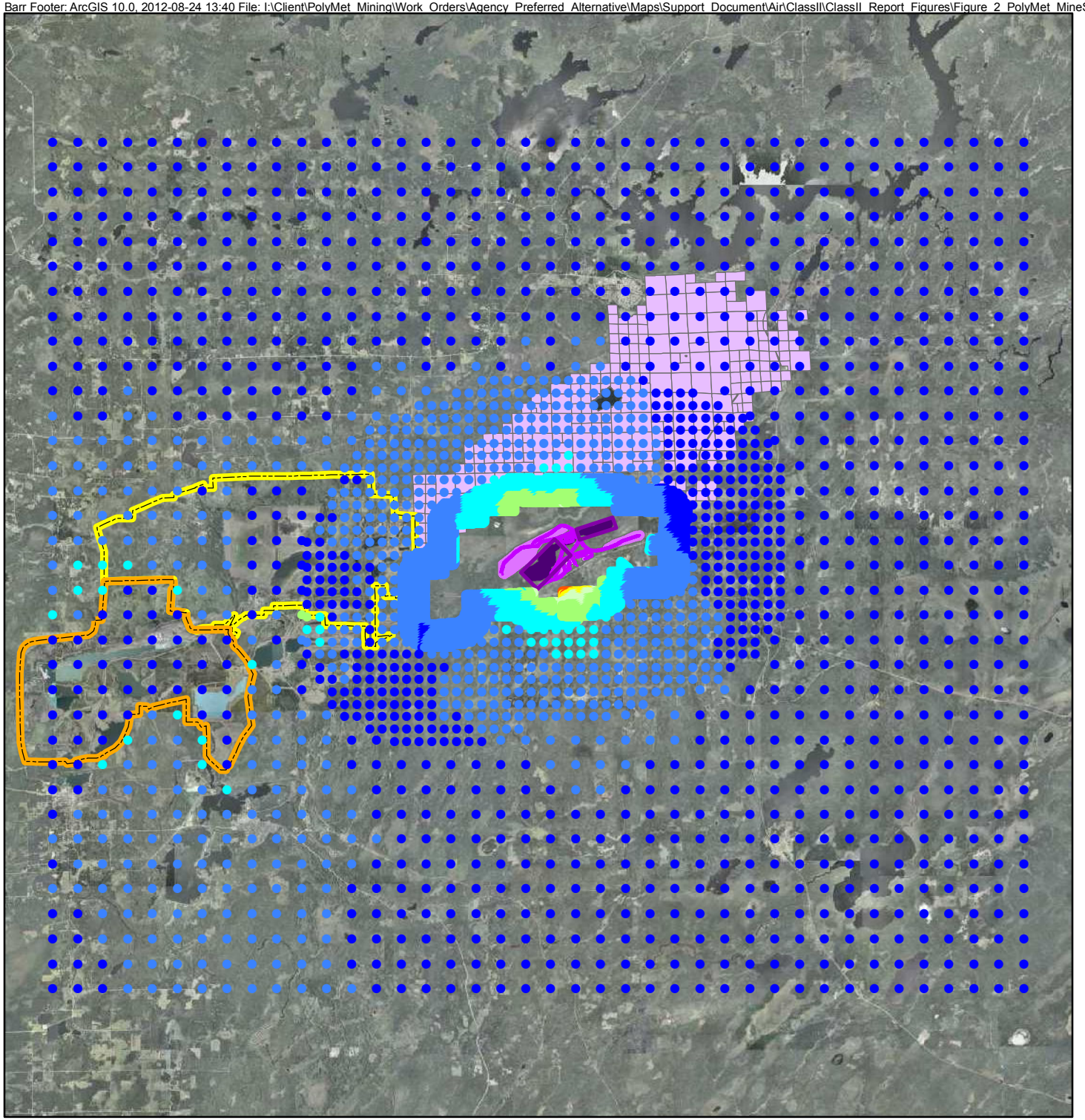
N

Kilometers

5 0 5

Figure 1

EIS CUMULATIVE NAAQS/INCREMENT
RECEPTOR GRID
PolyMet Mine Site EIS
Class II Modeling Report
NorthMet Project
Hoyt Lakes, MN



H2H Concentration (ug/m^3)

- 0 - 1
- 2 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 27

Mesabi Nugget AAB

NorthMet Plant Site AAB

St Louis County Tax Records

Open Pit Sources

Volume Sources

PM_{10} 24 Hour Increment is 30 ug/m^3.

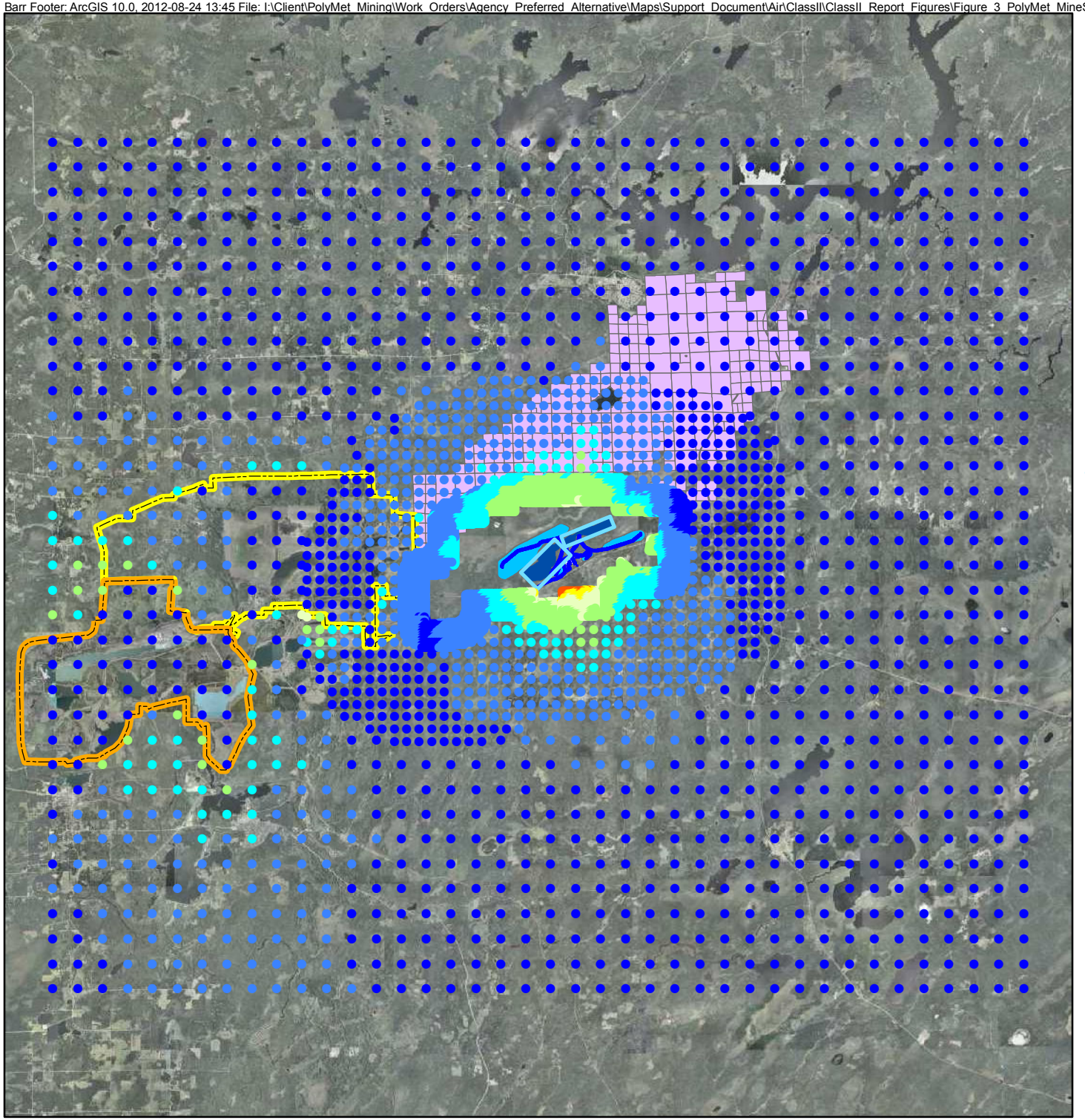
N

Kilometers

5 0 5

Figure 2

24 HOUR PM_{10} INCREMENT
YEAR 8 RESULTS
PolyMet Mine Site EIS
Class II Modeling Report
NorthMet Project
Hoyt Lakes, MN



H2H Concentration (ug/m^3)

- 0 - 1
- 2 - 3
- 4 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- Mesabi Nugget AAB
- NorthMet Plant Site AAB
- St Louis County Tax Records
- Open Pit Sources
- Volume Sources

PM_{10} 24 Hour Increment is 30 ug/m^3.

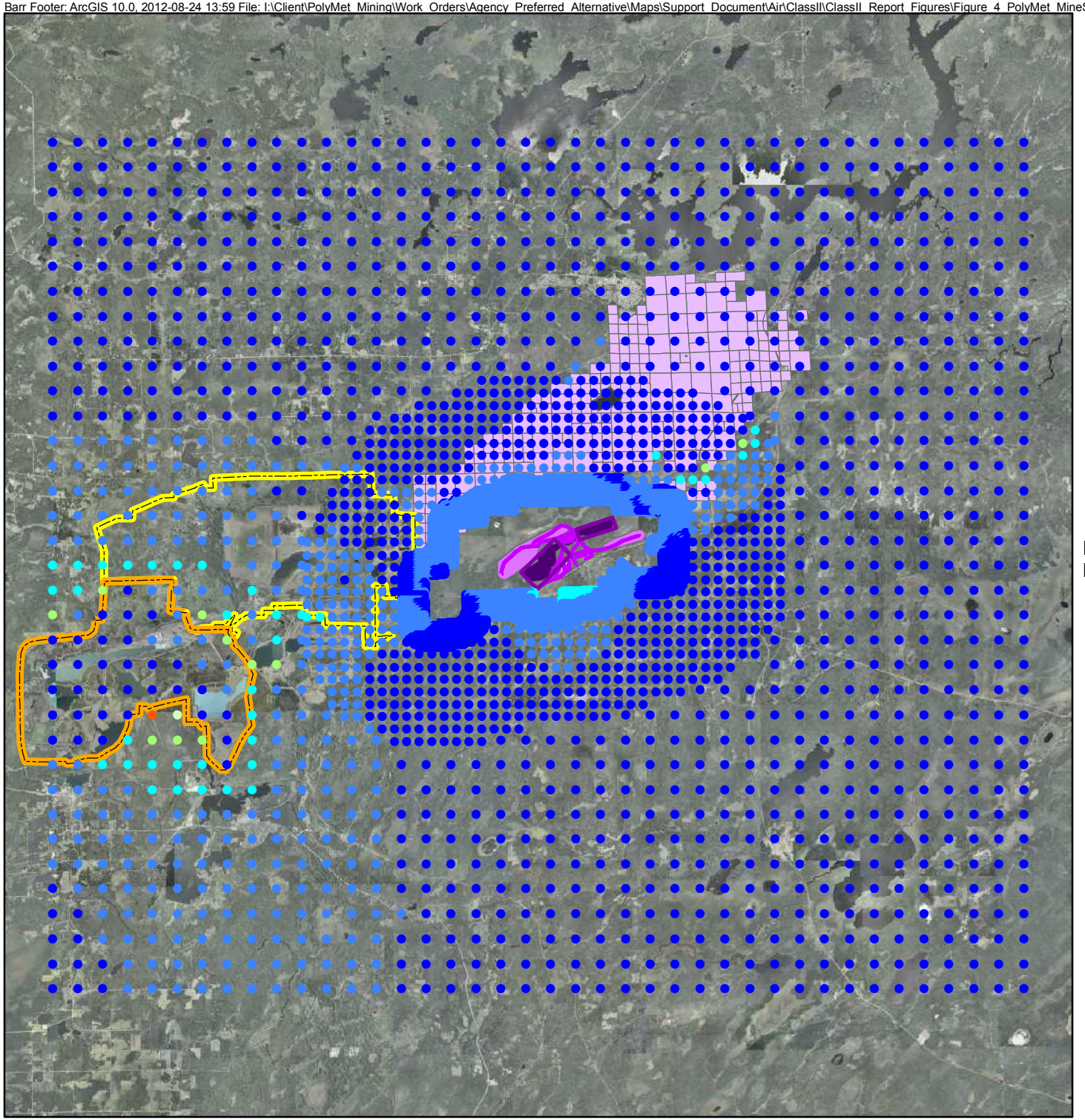
N

Kilometers

5 0 5

Figure 3

24 HOUR PM_{10} INCREMENT
YEAR 13 RESULTS
PolyMet Mine Site EIS
Class II Modeling Report
NorthMet Project
Hoyt Lakes, MN



H6H Concentration (ug/m^3)

- 37 - 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 84
- 85 - 88
- Mesabi Nugget AAB
- NorthMet Plant Site AAB
- St Louis County Tax Records
- Open Pit Sources
- Volume Sources

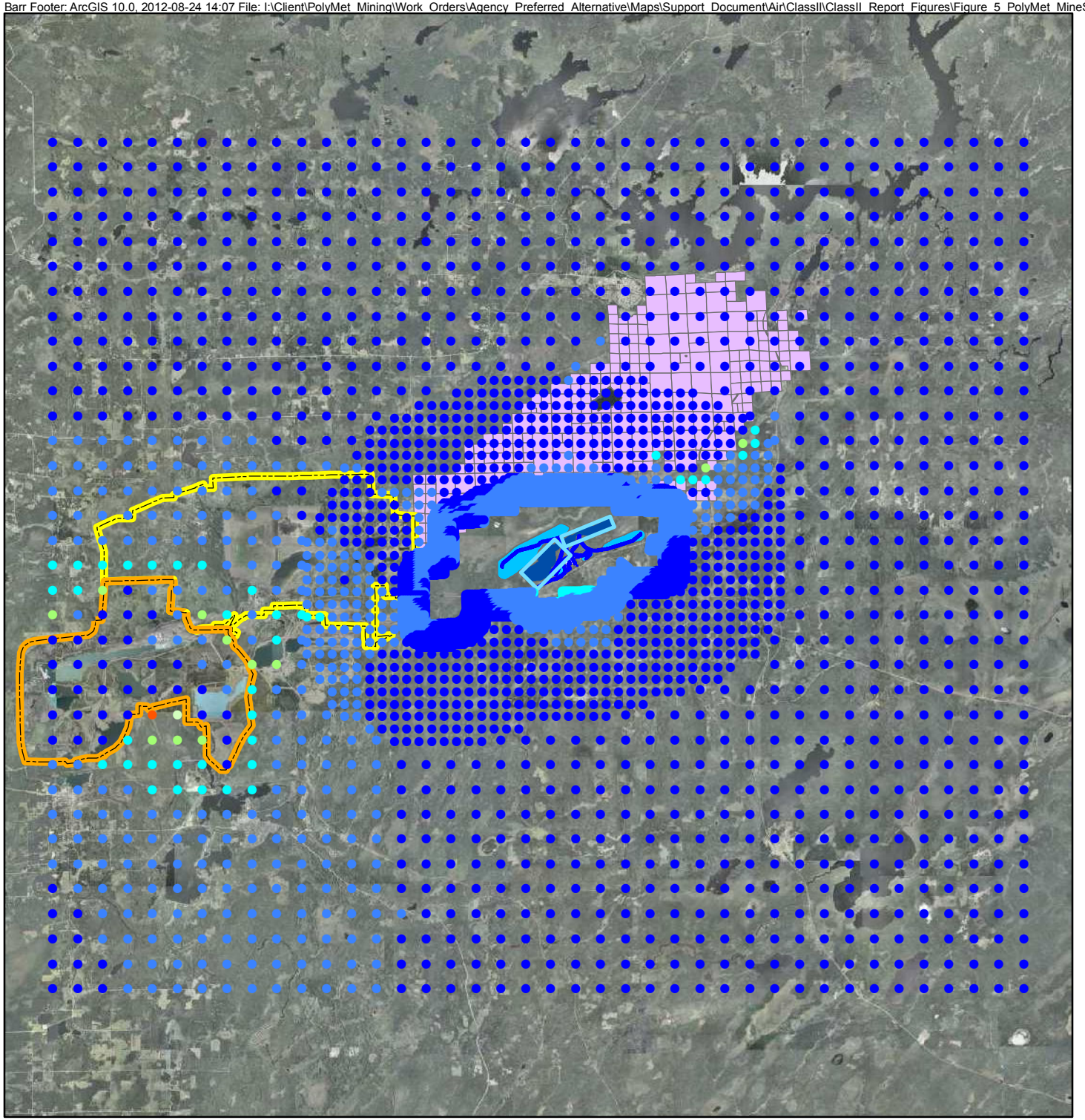
PM_{10} 24 Hour NAAQS is 150 ug/m^3.
Background Concentration Included = 36 ug/m^3

N

Kilometers
5 0 5

Figure 4

24 HOUR PM_{10} NAAQS
YEAR 8 RESULTS
PolyMet Mine Site EIS
Class II Modeling Report
NorthMet Project
Hoyt Lakes, MN



H6H Concentration (ug/m^3)

- 37 - 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 84
- 85 - 88
- Mesabi Nugget AAB
- NorthMet Plant Site AAB
- St Louis County Tax Records
- Open Pit Sources
- Volume Sources

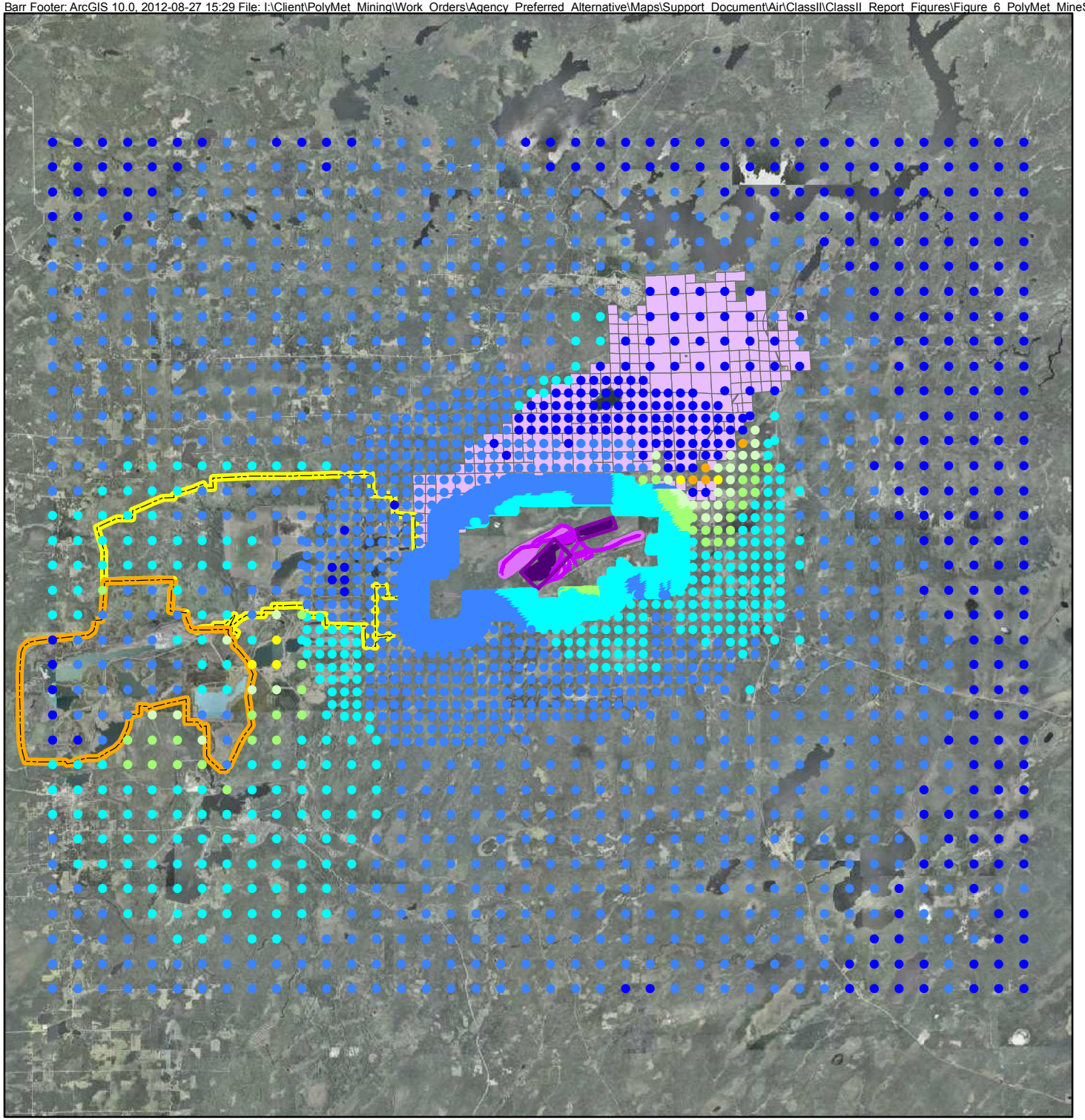
PM_{10} 24 Hour NAAQS is 150 ug/m^3.
Background Concentration Included = 36 ug/m^3.

N

Kilometers
5 0 5

Figure 5

24 HOUR PM_{10} NAAQS
YEAR 13 RESULTS
PolyMet Mine Site EIS
Class II Modeling Report
NorthMet Project
Hoyt Lakes, MN



H8H Concentration (ug/m^3)

- 17.2 - 18.0
- 18.1 - 20.0
- 20.1 - 23.0
- 23.1 - 25.0
- 25.1 - 28.0
- 28.1 - 30.0
- 30.1 - 32.5
- Open Pit Sources
- Volume Sources
- Mesabi Nugget AAB
- NorthMet Plant Site AAB
- St Louis County Tax Records

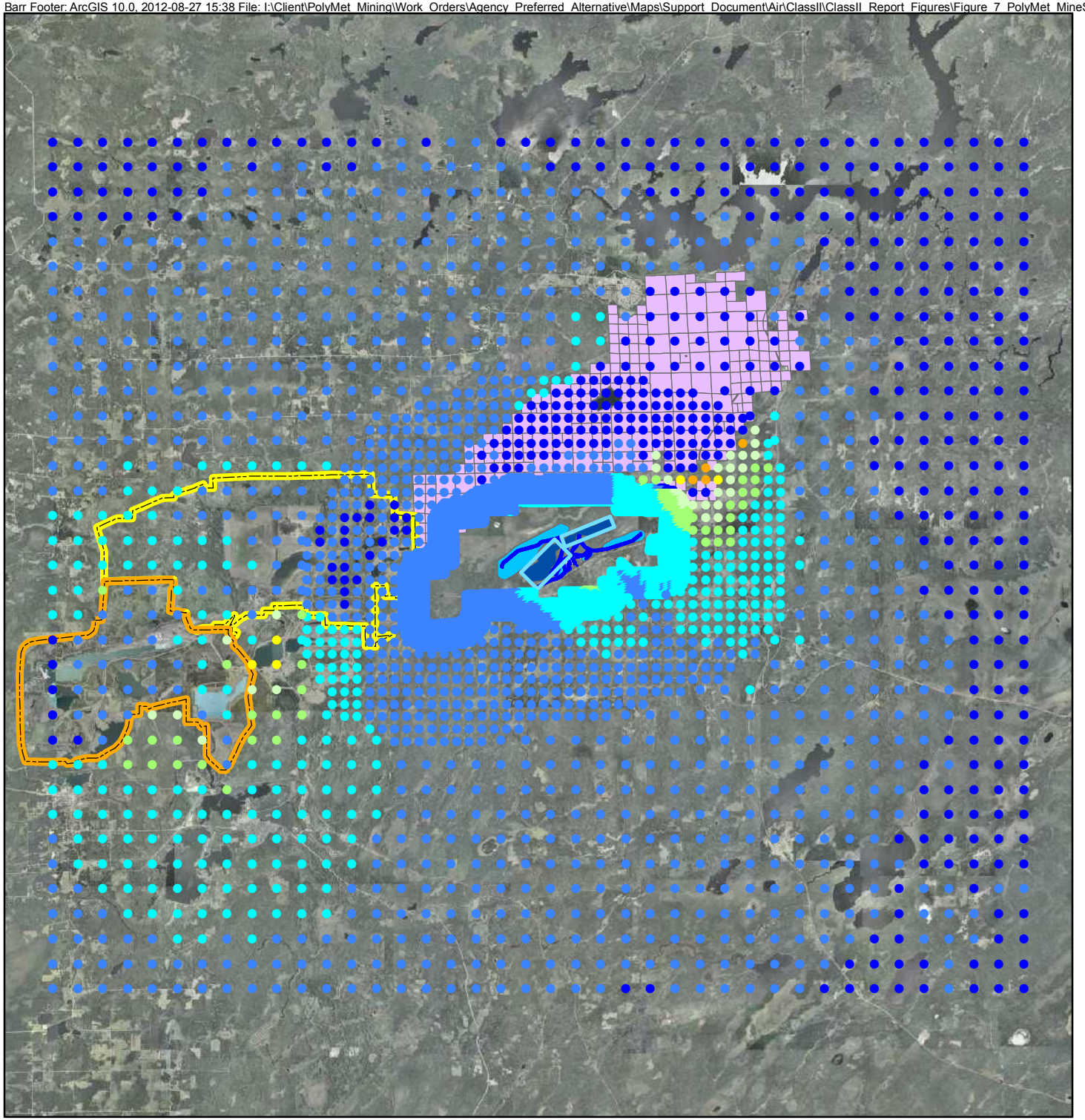
$PM_{2.5}$ 24 Hour NAAQS is 35 ug/m^3.
Background Concentration Included = 16.5 ug/m^3

N

Kilometers
5 0 5

Figure 6

24 HOUR $PM_{2.5}$ NAAQS
YEAR 8 RESULTS
PolyMet Mine Site EIS
Class II Modeling Report
NorthMet Project
Hoyt Lakes, MN



H8H Concentration (ug/m^3)

- 17.2 - 18.0
- 18.1 - 20.0
- 20.1 - 23.0
- 23.1 - 25.0
- 25.1 - 28.0
- 28.1 - 30.0
- 30.1 - 32.5
- Mesabi Nugget AAB
- NorthMet Plant Site AAB
- St Louis County Tax Records
- Open Pit Sources
- Volume Sources

$PM_{2.5}$ 24 Hour NAAQS is 35 ug/m^3.
Background Concentration Included = 16.5 ug/m^3.

N

Kilometers
5 0 5

Figure 7

24 HOUR $PM_{2.5}$ NAAQS
YEAR 13 RESULTS
PolyMet Mine Site EIS
Class II Modeling Report
NorthMet Project
Hoyt Lakes, MN